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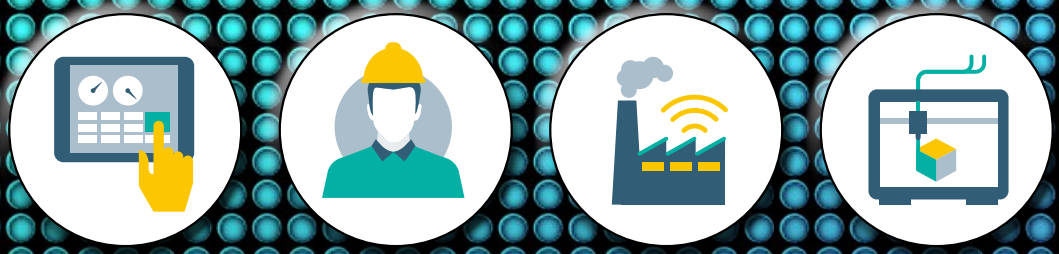

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New Automation Technology **BECKHOFF**

If your PC is at risk, so are your operations

Industrial enclosures protect far more than just plant-floor electronics. They help assure uptime, safety, security and production flexibility, too

by Keith Larson

Since the advent of the first IBM personal computer (PC) in the early 1980s, the PC has evolved into an essential tool for the modern manufacturing operation. Today, PCs based on Microsoft Windows operating systems and Intel microprocessors ("Wintel" architecture for short) serve to control manufacturing processes, collect and analyze data, and communicate meaningfully with human operators and with other networked plant management systems. In short, their ability to simultaneously address both deterministic automation tasks and less time-sensitive information management, communication and integration requirements has led to their widespread deployment across industry.

Sometimes, PCs used for industrial applications are fortunate enough to reside in the relative comfort of a control room adjacent to production operations. But more often than not, they're needed closer to the action—mounted on or near the machines and processes they control. And while manufacturing and other industrial operations continue to benefit from rapid advances in the broader PC market, commercial ones were never intended for the rigors of plant-floor operations. Indeed, using a naked "white-box" PC introduces a range of operational risks ranging from downtime to operator injury, any one of which can quickly swamp any savings realized at the outset.

To mitigate these risks, system designers have the option of specifying a sealed, industrially hardened computer that's ready to deploy in an industrial environment. Or, they can choose

an appropriately sealed and hardened industrial enclosure into which a more general-purpose computer can be placed. Either approach can perform admirably when it comes to ensuring the integrity of routine operations, effectively isolating sensitive PC electronics from their surroundings. Longer term, however, the choice between an industrial PC and a hardened enclosure must take into account lifecycle costs, operational continuity and the accelerating pace of information technology innovation.

MINIMUM DOWNTIME

The foremost and most obvious operational risk that comes with using an unprotected commercial PC is that of downtime. The value of even an hour's worth of lost production—and potentially of in-process inventory that must be discarded—often crystallizes the value of a more robust solution in the mind of even the most budget-conscious operations manager. In particular, commercial PCs are vulnerable to the harsh operating conditions endemic to plant-floor environments, especially temperature extremes, water and other corrosive or even explosive substances.

While commercial PCs often include some sort of light-duty fan to dissipate heat, these often prove inadequate when it comes to the higher temperatures encountered in an industrial context. Further, they do nothing to address sudden changes in temperature. Indeed, sometimes it's not the absolute temperature that causes damage, but an abrupt drop that results in condensation in the computer and subsequent failure. The ingress of dripping or sprayed water, corrosive chemicals or gases also put unprotected electronics at risk.

To counter these threats, manufacturers of industrial enclosures use a variety of special seals and configurations to protect against drips and hose-directed sprays. Onboard heating and cooling systems ensure that electronics are kept within an optimal temperature range and that condensation is prevented. Purge systems are sometimes added to prevent the ingress of corrosive or explosive gases. Indeed, the common protective requirements for electronic equipment deployed in industrial environments have given rise to classification methodologies developed by a number of industry organizations, notably the National Electrical Manufacturers Assn. (NEMA) in the U.S. and the International Electrotechnical Commission (IEC) as shown in Table I.

Water, chemicals and other foreign matter aren't the only intruders that can wreak havoc on the continuous operation of electronic equipment. Electromagnetic and radio frequency interferences (EMI and RFI) from nearby electrical equipment can cause not only outright downtime but result in maddeningly intermittent problems

NEMA Classification	Comparable IEC Classification	Description
4	IP 66	For indoor or outdoor use, providing "a degree of protection" to personnel against access to hazardous parts as well as a degree of protection of the equipment inside from solid foreign objects (falling dirt and windblown dust); ingress of water (rain, sleet, snow, splashing water, and hose directed water), and external formation of ice.
4X	IP 66	Similar to NEMA 4, with added protection against corrosion
6	IP 67	Similar to NEMA 4, with added protection against water ingress when temporarily submerged
12	IP 55	For indoor use, with protective measures oriented toward dripping and light splashing of water.
13	IP 65	Similar to NEMA 12, with added protection against splashing and spraying of oil and non-corrosive coolants.

INGRESS PROTECTION RATINGS

Table I: While not strictly equivalent, these NEMA and IEC IP (ingress protection) ratings are commonly used for PC and other enclosures intended for industrial applications.

that are particularly difficult to diagnose and resolve. To prevent these issues, a properly designed industrial enclosure acts as a Faraday cage, a conductive "shell" around the PC that effectively isolates it from its surroundings, and prevents disruptive RF/EM signals from entering—or escaping—the enclosure.

Another way that an industrial enclosure can help reduce downtime is with the inevitable eventuality of computer failure. While an industrially hardened computer should last longer than a protected commercial one (after all, that's a big part of the initial price premium), hardware failures do happen—sometimes six months down the road, sometimes six years. Industrial computers, on the one hand, are often relatively inflexible when it comes to repairs. Their sealed design may require a visit from the supplier's service technician or shipment back to the manufacturer. Restoring production quickly after a failure entails holding an expensive spare unit in inventory that grows increasingly outdated over time.

Contrast this with an industrial enclosure teamed with a commercial PC that can be quickly swapped out with a late-model version that's often more capable than the one it replaces (and is likely less expensive, too). The lowerprice point means lower inventory costs for carrying spares. Plus, a defective commercial PC would likely not be repaired at all, but simply tossed in the electronics recycling bin.

SAFER, MORE SECURE OPERATIONS

While the costs and implications of production downtime can be readily calculated, risks to operator safety—and its close cousin in security—are perhaps more compelling. An industrial enclosure not only protects its contents from the world around it, but plays an important role in protecting human operators from harm.

For example, the same purge system that protects a PC from the ingress of corrosive gases can prevent a potentially explosive mixture from reaching an ignition source. Industrial enclosures are designed to prevent the ingress of fingers or misdirected screwdrivers that could result in electrical shocks. Further, industrial enclosures better facilitate the use of formal lock-out, tag-out methodologies that physically prevent inadvertent start-up of a machine or electrification of a circuit when maintenance tasks are being performed.

An unprotected commercial PC is also physically vulnerable to unauthorized access by naive or malicious persons. A locked industrial enclosure provides a first level of defense against unauthorized access and protects the PC's USB ports and other media drives. The choice of hinge design (internal vs. external), locking/latching mechanism, as well as material of construction (thick steel vs. thin composite materials) also contribute to physical security.

PRODUCTIVITY AND AGILITY

If avoiding downtime and improving operator safety and operational security aren't reasons enough to choose an industrial enclosure teamed with a commercial PC to address your plant-floor computing needs, consider the ways in which this flexible approach can both boost worker productivity today and responsiveness to changing needs down the road.

First, industrial enclosures come in a broad array of configurations designed to help plant-floor operators be more productive. This may include industrial casters designed to move the PC station around the floor, maintaining ready operator access as they physically move from task to task. Or the PC monitor enclosure itself might be mounted on a swing arm that can be optimally positioned to the needs of each individual operator.

Agility, on the other hand, refers to the ability to respond quickly to changing market demands or opportunities, and in this context, arises from the deliberate decoupling of investment in system components with relatively short lifecycles (the PC and its software) versus those elements designed to last much longer (the industrial enclosure itself). When new software is available that can bring desirable operational improvements but doesn't run on your aging PC, the upgrade path is straightforward and cost-effective as well.

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Modularity more than the sum of parts

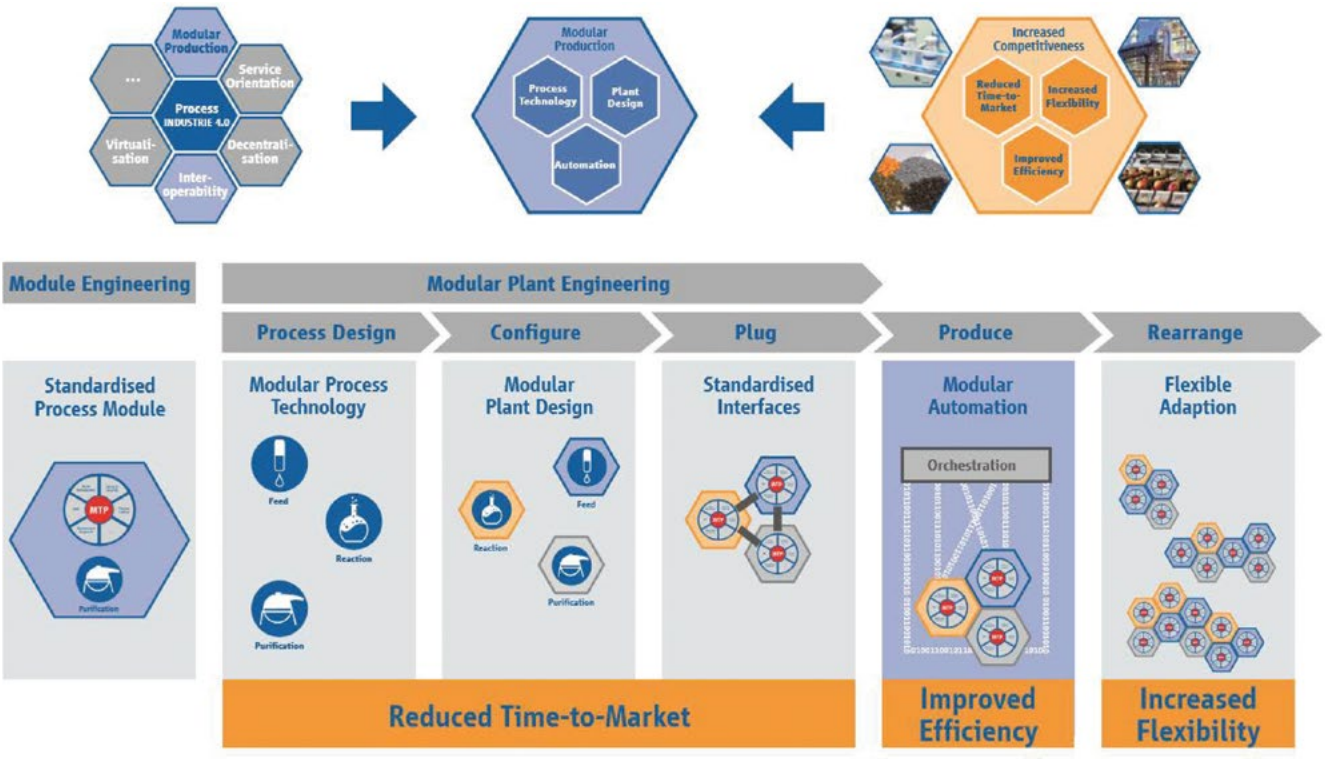
Module Type Package (MTP) standardizes device descriptions and process interactions to streamline programming and production

by Jim Montague

It's a bad idea to glue Legos or other building blocks together because you can't take them apart, reassemble and rebuild, or create something new and different later. To avoid similar restrictions, discrete manufacturers have been seeking less constrained devices, and developing more modular equipment and production lines for years—but lately process users are seeking the same flexibility and advantages.

Module Type Package (MTP) is a standardized, non-proprietary way of describing process automation modules from individual components up to production skids, which lets them work with other modules, and fit more easily into larger applications. These common, shared definitions of basic capabilities, interfaces and services reportedly let MTP modules plug-and-play with other compliant devices and systems. This can save huge amounts of time and labor that's usually spent on programming, configuration, data conversion, networking and getting non-interoperable devices to work together.

"MTP can save up to 50% on the engineering effort required to build process plants, including skids and package systems," says Axel Haller, global segment manager for specialty chemicals and life sciences at ABB (www.abb.com), and chair of the MTP working groups at ZVEI (www.zvei.org), the Electro and Digital Industry Association. "Users can do a proof of concept (PoC) by contacting their suppliers, adapt it to their processes, and see the benefits for themselves. This is possible because MTP is agnostic and independent, so any five



MTP ENABLES MODULAR PRODUCTION

Figure 1: Module Type Package (MTP) consists of common, standardized, non-proprietary definitions of process automation components and services, which lets devices from different suppliers communicate, plug-and-play, fit more easily into larger process applications, and potentially save huge amounts of time and labor on design, engineering, configuration and maintenance. Source: NAMUR and ZVEI

modules can connect to five different PLCs or DCSs. Because they're all using the same language, MTP can also help a supplier with a specific PLC or DCS link to others without having to do as much reconfiguring, or spend as much on fees for optional modules. Easier connections with MTP can also help suppliers protect their intellectual property."

PIECES IN THE PLAYSET

Presently under development, the MTP standard effort was started in 2014 by the NAMUR (www.namur.net/en) association of process industry end-user companies, which drafts recommendations with help from ZVEI and other groups and suppliers. NAMUR reports that MTP is designed to use intelligent equipment modules for production, improve flexibility and increase efficiency, enable package unit integration, allow quick and easy adoption of new processes, fulfill individual users requirements, cut engineering and automation costs for plant conversion, and reduce time-to-market for products.

"MTP consists of standardized descriptions of a process module's functions, which can be used like a mouse driver to integrate mixers, reactors, heaters, distillation units and other devices with their controls and other modules," says Dr. Jens Bernshausen, PLC and process control technology manager at Bayer (www.bayer.com), and plug-and-produce working group leader at NAMUR. "The engineering workflow for MTP begins with making sure each standardized module has its own control capability, and using AutomationML (AML) data format and OPC UA networking to coordinate between modules. MTP is technically and vendor neutral, so its five main aspects of process control, HMI, maintenance and diagnostics, alarm management, and safety and security can be employed or not by each user. For instance, they can move static and dynamic data for their HMI from a PLC to their DCS within MTP's service-based architecture."

Jesse Hill, process industry manager at Beckhoff (www.beckhoff.com), adds that MTP allows secure interoperability between automation systems from different vendors, and eases development because users can employ modules from suppliers that know its production best. "Because each MTP module has its own controller, it can import HMI designs and other data into the controller to make an MTP file, which it can export to other systems, orchestration and higher-level controllers," says Hill. "MTP is a way to take engineering and programs from a module or library, and integrate them into a DCS. For example, an MTP file can integrate HMI screens into a DCS, which reduces programming because they don't have to be recreated every time. This is using IT-based strategies that have been available for a long time."

TIMELINE AND SCHEDULE

Bernshausen reports that NAMUR, ZVEI and their joint working groups are writing a German national standard for MTP, entitled VDI/VDE/NAMUR Guideline 2658 (www.vdi.de/en/home/vdi-standards/details/vdivde-namur-2658-blatt-1-automation-engineering-of-modular-systems-in-the-process-industry-general-concept-and-interfaces). So far, they completed and published three sections, including basic concepts and interface definitions, descriptions and modeling of HMI to process equipment assemblies, and interfaces and libraries for basic object types. The draft of the fourth section, services for process control equipment assemblies, is being reviewed, and is expected to publish late this year or in early 2022. Several suppliers plan to release MTP products as soon as the fourth section is approved. Sections for standardizing 10 more functions are in the works, including monitoring and diagnostics, safety and cybersecurity.

The organization is also integrating MTP with its NAMUR Open Architecture (NOA) for adding and monitoring sensors, and reduc-

ing PLC workloads by using a second channel to deliver applicable data directly to Industrial Internet of Things (IIoT) devices and cloud-computing services. Finally, NAMUR also plans to get MTP adopted as an International Electrotechnical Commission (www.IEC.ch) standard, entitled IEC65E/663/NP, "Automating engineering of modular plants."

"The working groups are determining how MTP modules should do maintenance and diagnostics, alarm management, and safety and security," says Bernshausen. "Using MTP modules lets users go from spending a month or more designing, integrating and configuring a skid or package system to doing it in just a few days. Plus, MTP isn't just useful for new devices and greenfield applications, but it can also upgrade existing equipment and brownfield processes. For example, it's possible to add modular components to a steam unit, and use MTP to integrate them more easily, which can also enable equipment leasing or buying steam or other production on a subscription basis."

To deliver MTP's potential benefits, Bernshausen adds that users should ask vendors for more modular, standardized and pretested products, and specify MTP for them. "It used to take a lot of time to design and configure a skid or other equipment. Users ordered pre-engineered packages and automation systems, which might not interoperate when they tried to integrate them," says Bernshausen. "Now, MTP lets users employ the best controls and other devices available from each supplier, and be more certain they'll work together."

MOVING TO MODULAR

"Many processes and batches are getting smaller, more numerous, and have more varied specifications, so process engineers want to standardize their individual production units, such as mixers, fermenters and skids, and combine new plants made of these standardized modules, so they can gain flexibility and reduce costs," says Dr. Eckhard Roos, head of industry segment and key account management for the process industries at Festo (www.festo.com). "MTP and standardized modules can also help users test new processes, and handle them as they also become more numerous."

While its origins and methods can be traced to the well-known S88 batch standard, Roos reports that MTP is based on NAMUR NE 148 and its main recommendation that each module possess its own PLC to control its sensors, I/O points, actuators and other components, be able to act on them and connect to upstream and downstream modules, such as SCADA systems and DCS, and integrate these standardized modules with the least effort.

To enable a device as an MTP module and link it with a SCADA system, Roos explains its engineering process needs to be defined by having its supplier provide

the data needed for it to be represented in the larger SCADA environment. This includes number of devices, where it's located in the interface, what its colors mean and other relevant details. To connect modules and services with a DCS, MTP is loaded into its orchestration layer, where it can provide services, properties of services and interfaces. "If everyone follows this standard, then OEMs can pick any PLC for the equipment they build, and their data can be represented immediately in the system those devices join," says Roos. "We can now connect a Festo PLC to an ABB or other SCADA systems, and it's easy to make those links with little effort. In the past, the PLC, SCADA and other devices came from one supplier, and if they didn't, there were connection and performance problems.

Roos adds that NAMUR's working groups overcame these traditional interoperability problems by getting everyone at the same table, and defining the data sets needed to represent MTP modules in SCADA, DCS and other supervisory systems. They agreed to use AML as the way to get data for graph-

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ics to supervisory systems, and agreed to use OPC UA for communicating between runtime operating systems. “This lets OEMs choose what they want for automation, encourages existing suppliers to join, so they don’t lose business, and lets new suppliers come in, too,” says Roos. “MTP and standardizing on AML also means OEMs don’t have to know how to program every type of PLC, and can instead learn just one, which is less complex, cuts costs, and is easier to maintain and fix.”

Charlie Norz, automation product manager at Wago (www.wago.com) reports it used to be an engineering feat and very time consuming to get a DCS and its orchestration architecture to show the operations of individual equipment and add new ones. “System integrators and OEMs had to coordinate with their DCS supplier, and exchange memory locations, diagrams and screens, and secure P&IDs to be recreated in the HMIs, which could take hundreds of hours,” says Norz. “Now, they can use MTP to export files to a DCS more easily, which can show how graphics should look, share memory locations, and automatically provide required look and feel. MTP can save many hours by automatically drawing the data that needs to be shown on an HMI. For instance, a typical water/wastewater facility may have four possible suppliers, but following MTP makes it easier for them to pick the equipment that best suits their needs. MTP makes controls more readily available because its modules interface with the orchestration later.”

Norz reports that Wago has added MTP function block libraries to its eCockpit PLC software, so users can export AML files to their DCS, or let suppliers add MTP to the controls in the products they’re providing to others. “For instance, a hot water system manufacturer may have a memory location for a start/stop function handling temperature measurements or flow rates, and MTP can expose that information to the orchestration system and the DCS can use it. This flexibility saves time compared to the rigid and manual methods of the past, but MTP also helps users maintain their processes by making it easier pull, replace and integrate new devices.”

PROOF IN PILOT PROJECTS

While MTP hasn’t been launched in mainstream production applications—at least none that have been disclosed—it’s been proven in several modular PoCs and pilot projects.

Evonik (evonik.com) recently implemented MTP modules in three projects. The first pilot is a modular, lab-based plant at its facility in Marl, Germany. It includes components from ABB, Wago and Orca, which were successfully used to start up an orchestration prototype, provide fast exchangeability, and use MTP to streamline development of HMI, alarm management, runtime communications and services.

The second is a PoC involving module orchestration via IIoT that's is also at Marl. It integrates components and software from Phoenix Contact and PTC, including its ThingWorx IIoT platform, which can reportedly fulfill the technical requirements of the process orchestration later (POL) for MTP use cases. It's also expected to enable easy integration of added functions, such as access to engineering and operations data, PIMS and SAP.

Located at Evonik Singapore, the third pilot uses MTP to integrate refrigeration units from Engie for synthetic amino acids into a DCS. It employs devices and software from Yokogawa for plant automation, as well as Siemens for module automation and operations. It was successfully implemented in 2019.

Similarly, the "invite" project is a modular plant developed by Bayer, Siemens and Festo that's commissioned and functioning. It integrates modules with Siemens' MTP-ready PCS neo AS and S7 PLCs networked with Profibus DP and Profinet, as well as Festo PLCs serving as MTP modules networked by OPC UA.

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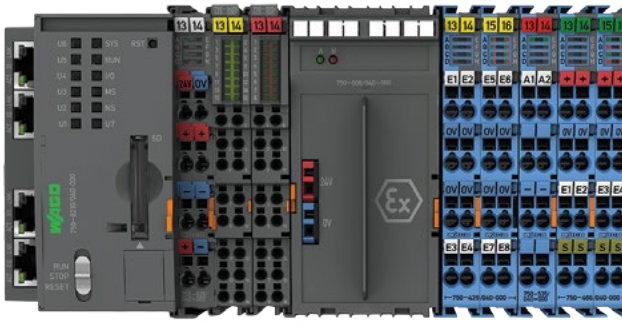

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WAGO

Peering through the digital keyhole

HMI standards don't tell us how to replace the holistic view of the panel graphic.

by John Rezabek, Contributing Editor

The hodge-podge of controls at the wastewater plant were the last to be migrated to a DCS platform. Back then, wastewater processing didn't make any money for the enterprise—it was purely a cost. And, while the cascade of separators to flotation units to aeration basin/digesters to sand filters and, ultimately, to the outfall, progressed slowly by comparison, the unit supervisor was still uneasy about running it all from DCS graphics. As we finished cutting the plant over and started to demo the panel, he appealed to us to save the panel graphic. Looking at little 21-in. screens—CRTs in that day—he was afraid his operators would lose sight of how everything was interconnected.

If you're old enough to remember when HMI was the less gender-neutral MMI, you probably recall when the panelboard was a vast wall of faceplates and recorders, and maybe a console where individual temperatures could be displayed by flipping toggle switches. Above the panel board was a two-dimensional schematic or panel graphic, a custom pictorial that depicted the major vessels, columns, heaters and reactors, and incorporated a select number of lighted boxes for showing specific alarms in the equipment affected. The feedstocks started at the far left, and one could follow the path of the process all the way to product storage. If you had no mental model of how raw materials made their way from crude feed to refined products, there it was—you need only look up on the wall.

Immersed in the age of the microprocessor and highly configurable operator graphics, we're trying to recapture some of the panel graphic awareness of the past. For decades, we've transitioned operators from the holistic but primitive panel board to staring at CRTs, and now flat screens and projections on the far wall. Before controls engineers grasped it, operations folks expressed qualms about how the new reality was going to work. A decade or two into the new age of computer-based HMI, engineers began to come to their senses about what made an effective interface. From alarm rationalization (we were heedlessly indulgent in the creation of alarms when they became "free") to gray-scale graphics that only use color for alarms, a new science of operator interface design has evolved. Recommendations and best practices have given way to standards, like ISA101. In a way that harkens back to the panel days, graphical interfaces favor analog representations of numbers and digital data—cartoon-like facsimiles of gauges, thermometers, bar graphs and recorders.

The coming and much-hyped tsunami of digital information is promising to grant the end user unprecedented insights into the state of the process. As we connect with more device intelligence via HART, wireless and fieldbus, do we know how to craft it so it's informative (information in context) and not noise? Does the operator on shift need to know that a steam trap is malfunctioning, a compressor is losing efficiency, an instrument enclosure is cold, or that a heat exchanger is fouling? If you answered yes or no, I'd argue you're wrong. In my world at least, the real answer is, it depends.

While the evolving standards and best practices have a lot to say about how to display information—e.g., don't go crazy with color, avoid black backgrounds, show numerical values graphically instead of displaying numbers, make sure your color scheme is consistent in its meanings across all graphics, and so on—it doesn't offer much guidance as to what should be on the operator interface, especially the overview display that's intended to function like the old panel graphic.

The pioneers of operator interface, such as the members of the Center for Operator Performance, are still exploring best practices for overview graphics. Like trying to write a procedure for how fighter pilots should behave in a dogfight, it defies standardization. The wastewater treatment supervisor wanted his operators to think and visualize beyond the digital keyhole of insight we could provide with instruments and graphics. The HMI should not only accommodate this, but also stay out of the way of operators' comprehension of the state of the process.

Edge solution conquers connectivity challenges

Remote vision, inspection and detection solution is powered by advanced edge computing

by Kaylor Greenstreet, Twin Eagle Solutions

Many industries—such as upstream oil and gas, water/wastewater, renewable energy and power distribution utilities—operate large numbers of remote sites. Modern sensors, automation systems and connectivity are vital for monitoring and controlling these widely dispersed assets. But many of these operations also demand onsite inspections by personnel, in some cases at every site, every day.

It's tempting to think that the proliferation of consumer-grade cameras could be leveraged to help these companies keep an eye on their assets, but the reality is there are many technical reasons why only industrial-grade solutions will work in the long run. Connectivity to remote locations is expensive, limited in bandwidth and often intermittent, so a degree of intelligence must be built into any such solution to process and store data.

Twin Eagle Solutions (www.twineaglesolutions.com) was founded more than 20 years ago as an industrial wireless consulting company, and it has extensive experience in that field, along with enterprise-networking and edge-computing expertise. Understanding the need for always-on solutions that can excel in the harshest conditions with limited bandwidth, it combines advanced edge and Industrial IoT (IIoT) technologies to push data and imaging information cost-effectively from the edge to the office, without straining the network infrastructure.

LONG DISTANCE DILEMMAS

Automated production and operation sites in remote areas usually require attention beyond what can be provided by traditional instrumentation, programmable logic controllers (PLCs), human-machine interfaces (HMIs), and supervisory control and data acquisition (SCADA) systems. This often takes the form of in-person visits by operations, maintenance or engineering personnel. However, it's very expensive to deploy personnel to remote sites in terms of worker hours and travel expenses, and it increases risk of exposure to hazardous materials.

Even if a worker detects a problem, such as a leak, there may not be any indication of how long it's persisted. The leak could have started one minute before it was spotted or one minute after the last worker visit. End users everywhere are familiar with cameras used to monitor commercial and residential locations, so it seems natural to apply similar technology to industrial sites. Modern video and still cameras have the potential to take the place of some site visits, saving money and improving employee safety. If a picture is worth a 1,000 words, a video or enhanced video is worth much more.

Unfortunately, remote sites typically don't have fast, inexpensive or reliable upstream networking connections, so bandwidth usage must be carefully controlled. This means that local (edge) pre-processing is needed to evaluate video signals in near-real-time, and condense the data transferred upstream. Some industrial cameras with a certain level of intelligence are available, but another common need is to coordinate video information with other inputs from field sensors or smart devices such as analyzers. This provides a complete monitoring solution.

One other point to consider is how the Internet and cloud computing are used for a given implementation. Solutions that rely heavily or exclusively on these technologies may not be suitable for remote industrial applications. From a business standpoint, even if a remote monitoring solution uses some aspect of cloud computing or connectivity, many companies want to own and manage their own data, rather than leasing it as a service.

A BETTER VANTAGE POINT

Recognizing these and other issues, the Twin Eagle Solutions team applied years of field-networking experience to develop its VisionAery solutions. They became practical, in part, because of the availability and performance of Emerson's (www.emerson.com) edge controllers and industrial PCs (IPCs), both designed and rated for use in challenging environments.

An edge controller combines the functionality of a traditional deterministic PLC with general-purpose Linux-based computing, like a PC, in one consolidated and industrial-

PORTABLE OR STATIONARY
Figure 1: The VisionAery system, in either a mobile or portable version, can be deployed almost anywhere as a self-contained remote monitoring solution.

ized form factor. The deterministic side can interact with many types of field I/O signals, and can perform control and logic functions. The general-purpose side can communicate securely via a variety of communication protocols with intelligent field devices and higher-level systems, and it can interact with the deterministic side in a secure and carefully controlled manner using OPC UA.

An IPC is an even more capable general-purpose computing platform, and can run visualization, communication, analytical applications and more right at the edge. They can also interact with many PLCs or other field devices. Emerson offers both edge controllers and IPCs preloaded with industry-specific software to support edge and IIoT applications. Called PACEdge, the software enables scalable and open connectivity, visualization and analytics at the edge.

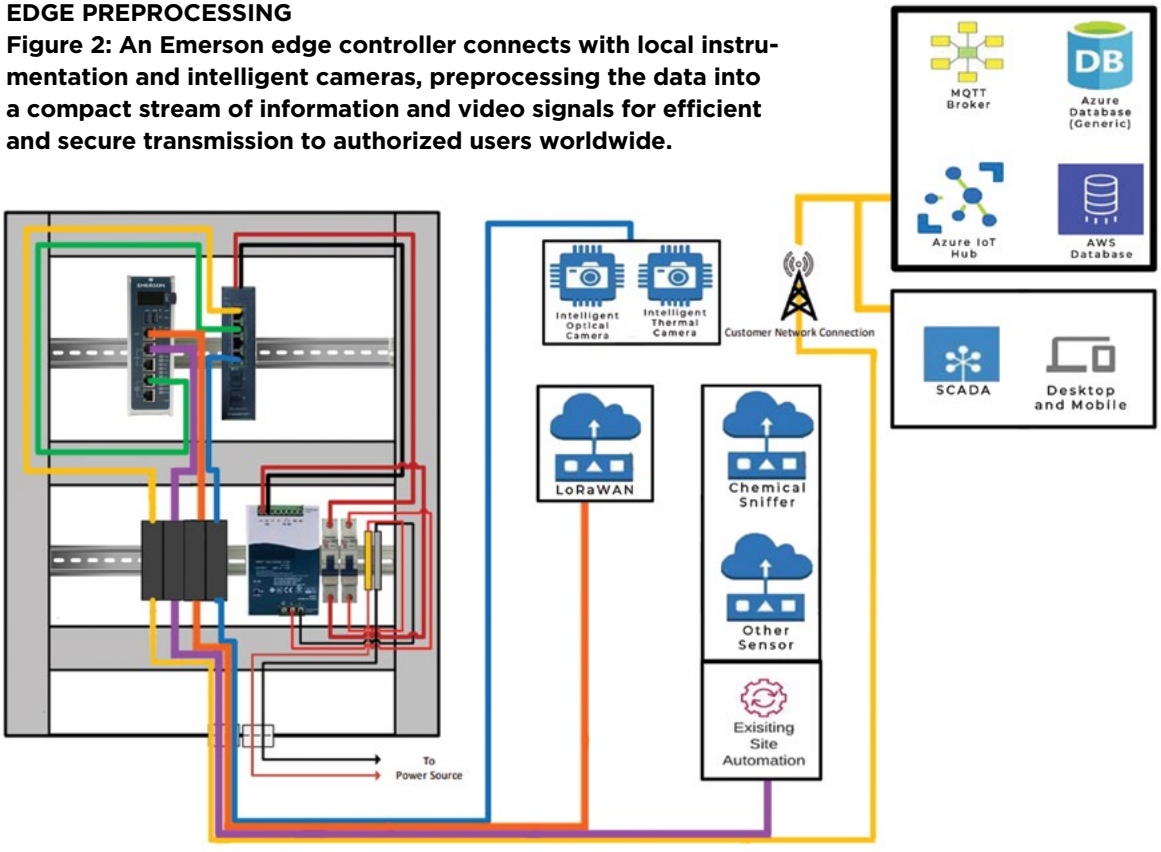
Edge computing is crucial for connectivity with intelligent field devices, and for performing the local edge computing necessary to consolidate edge data into useful information that can be sent offsite with minimal bandwidth required. Edge computing ensures that site/SCADA networks are not overloaded, and upstream communications costs (via cell, satellite or Internet) are minimized, providing users with the best view of their assets.

ACHIEVING CLARITY

When Twin Eagle set out to develop the

EDGE PREPROCESSING

Figure 2: An Emerson edge controller connects with local instrumentation and intelligent cameras, preprocessing the data into a compact stream of information and video signals for efficient and secure transmission to authorized users worldwide.

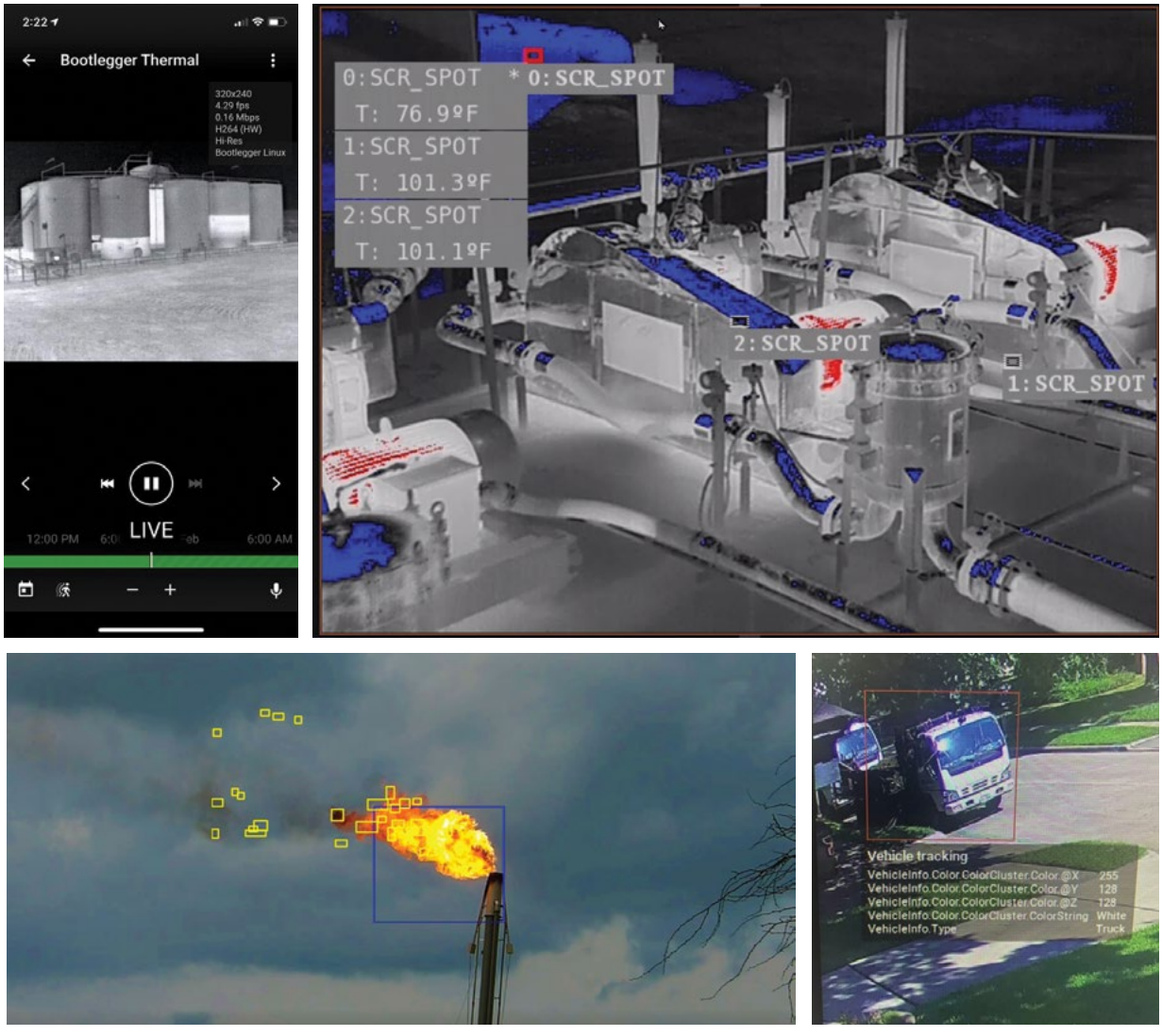


VisionAery concept, the original target was to support remote oil and gas production sites. However, the designs are suitable for any type of remote location. The team developed a mobile trailer-mount version (Figure 1) and a skid-mounted, portable version that can be hoisted or moved by forklift. To date, VisionAery systems have been deployed at more than 100 field sites.

All data is processed onboard the VisionAery system using an Emerson edge controller and/or IPC depending on the scale and extent of the application (Figure 2). Because data is preprocessed, the resulting information stream is greatly reduced, making the solution viable for sites with limited connectivity.

The standard Remote Vision version of VisionAery supports remote sites by providing:

- Remote site inspection via video zones;
- Automated gauge readings;
- Alerting on abnormalities;
- Automated site surveys;
- Automated recording on triggered events (such as trucks entering the site);
- Simple true/false analytics; and
- Event counting.



VIDEO & THERMAL INTELLIGENCE

Figure 3: The VisonAery platform uses Emerson edge technology to combine signals from intelligent video and thermal cameras with other site instrumentation, providing consolidated information such as (clockwise from top left) tank levels and leaks, equipment thermal profiles and operational parameters, vehicle tracking and flare status.

The more advanced Thermal Vision and Intelligent Vision versions provide added benefits (Figure 3), including:

- Detecting liquid levels and leaks;
- Monitoring flares (on, off or smoke);
- Supporting predictive maintenance for equipment;
- Monitoring to see if onsite personnel are wearing personal protective equipment (PPE);
- Identification of abnormalities;
- Tracking vehicle arrival/departure and operations, including license plate reading; and
- Integration with advanced analyzers such as methane leak detectors and audio analytics to listen for abnormal sounds.

Oil well site companies are subject to various operational environmental regulations, so it's vital to determine exactly when anomalous events like a smoking flare or leak started and how long they continued. Or, some sites must be periodically serviced by pump trucks, so detailed video information for vehicle tracking can ensure that service billing is correct.

All video and operational data is collected and stored locally, but local edge computing ensures that only essential results are transmitted to higher-level systems, so users obtain the best clarity regarding the situation in the field. Data can be converted at the edge into whatever protocol or coding language the end user needs, such as MQTT, JSON, Python scripts and more. Deployment is rapid, and Twin Eagle offers superior field support to adapt installations as needed for all types of field sites and enterprise computing host systems.

A NEW VISION

In addition to the technical merits, an edge computing solution is affordable, requires no monthly subscription fees, is suitable for all types of edge environments and applications, and is expandable/scalable for the future. There are minimal annual renewal costs for the video management software, but most clients realize a return on investment within 12 months or less. Emerson edge controllers and IPCs enable Twin Eagle's VisionAery to excel today, with the ability to meet any future needs, such as adding LoRaWAN communications or connectivity to other advanced field devices.

BEHIND THE BYLINE

Kaylor Greenstreet is a board member and vice president of business development at Twin Eagle Solutions, and is is one of the creators of the VisionAery platform. He holds a business marketing degree from the University of Phoenix.