the journal

JUNE 2023

from Rockwell A[illegible]on and our PartnerNetwork™

SPICE IT UP

See how a standardized digital solution helped a food ingredients manufacturer achieve better control and predictability by using smart manufacturing.

INSIGHTS INTO MEDIUM VOLTAGE DRIVE CABLES

10 TIPS FOR SECURE REMOTE ACCESS TO CONTROL SYSTEMS

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See how a standardized digital solution helped a food ingredients manufacturer achieve better control and predictability by using smart manufacturing.

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ADDITIONAL RESOURCES

WHITE PAPER

White Paper Explains How to Use PID Tuner Software

Download, "Successfully Optimizing Regulatory Controllers Without Risking Data Security," to learn how PID controller tuning software can use "live-historical" data without accessing data from a control network.
https://bit.ly/tj0123cswp

PODCAST

How a Standardized Process Eases DCS Migration

In this "Automation Chat" podcast, learn how to use a repeatable, step-by-step process to make sure nothing is missed when migrating legacy systems to modern distributed control systems.
https://youtu.be/N2RIvQKccel

EBOOK

2023 Smart Pharmaceutical Manufacturing eBook

This educational resource is designed to help life sciences firms increase operational excellence. Learn about enabling tech transfer, how the MTP standard enables plug-and-produce manufacturing and more.
https://bit.ly/tj23ephar

the journal
from Rockwell Automation and our PartnerNetwork™

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Rockwell Automation

Medium Voltage Drive Enclosures

Allen-Bradley® PowerFlex® 6000 medium voltage VFDs packaged in Type 3R or IP54 enclosures are designed for outdoor or remote installations to remove the need for a control room. The drive technology manages motor control applications from 150 to 11,000 kW (200 to 14,600 Hp) and voltage rated 2.3 to 11 kV. The custom enclosures suit remote oil, gas, mining or mineral processing operations, and where facility space is a premium.

The enclosures protect against weather and dirt and support a range of ambient temperature ratings from -40 to 50°C (-40 to 122°F). Open-loop, forced-air cooling or closed-loop air-to-air heat exchanger solutions are available to suit the application.

PRODUCT SPOTLIGHT

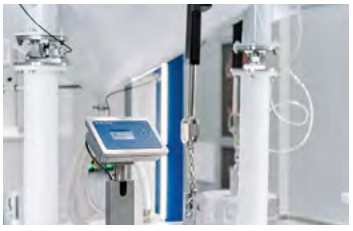
LAB ANALYSIS SENSORS

Rockwell Automation Strategic Alliance Partner **Endress+Hauser** offers five new laboratory sensors compatible with its Liquiline CML18 handheld laboratory analysis device. The Memosens CPL53E, CPL57E, CPL59E, COL37E and CLL47E liquid analytical sensors are designed to ease operation for end users and enhance good laboratory practice (GLP).

The sensors support data and quality management when verifying online measurements. They provide immediate and tamper-proof calibration history traceability, with easy data transfer using Bluetooth technology.

Using the bayonet connector, the plug-and-play units work out of the box with support for easily switching output parameters, such as pH, dissolved oxygen and conductivity, at the measuring point. Factory precalibration allows users to begin making measurements without initial calibration.

Weighing Indicator with Filling/ Dosing Application



Technology Partner **Mettler Toledo**'s IND360 compact automated weighing indicator includes new built-in filling and dosing application for decentralized control. The fill/dose application's self-optimizing algorithms are designed to provide tighter control, faster cutoffs, electronic filtering and increased throughput.

The unit operates as an ISA S88 state machine, allowing machine builders and control system integrators to adopt a decentralized control strategy by controlling filling and dosing locally.

Integrated control allows running the process faster than centralized systems, while reducing hardware and achieving tight fill tolerances. As a result, the PLC performs other critical functions more efficiently. The control state is monitored and controlled by physical I/O and one of seven automation interfaces available, including EtherNet/IP™.

Integrated Servo Motors

Technology Partner **Advanced Micro Controls Inc. (AMCI)** releases the SV400E2 integrated servo motor, expanding the torque options available within its integrated servo family. The unit incorporates a servo motor, drive and controller in a single unit. The integrated compact design is ideal for new machinery and retrofit applications.

Features include 1.3-Nm continuous torque with 3.5-Nm peak torque; an integrated dual-port switch with EtherNet/IP™ connectivity; simple performance tuning, dynamic torque control, and safe torque off (optional); virtual axis follower; absolute encoder feedback; built-in web server; and compatible cord sets.

Additional software is not needed, because everything is programmed from the PLC using the controller's native software.

Industrial Monitors

The **Allen-Bradley® ASEM™ 6300M industrial monitors** from Rockwell Automation offer several customizable design options.

Stainless steel models provide IP66K-rated and IP69K-rated options for washdown requirements. Other models address different needs, from economical aluminum options to edge-to-edge glass options for sleek, high-end displays.

Single- and multi-touch displays allow machine builders to match the monitors with their preferred software or to a user's operating requirements. Monitor sizes range from 8.4 to 24 in. and are available in both standard and widescreen formats.

High-resolution displays deliver critical production information in clear detail. The monitors can display up to four tiles of information on a single screen, including high-resolution videos and real-time camera feeds.

Panel Mounting Software

Eplan Smart Mounting software from Technology Partner **EPLAN Software & Service LLC** supports technicians in assembling and mounting all components in a control cabinet and on mounting panels. Presented in a user-friendly way and supported by a 3D visualization, the technician immediately recognizes where components must be placed.

The software provides production employees a complete list of all the work steps. It starts with the mounting DIN rails and cable ducts (as examples), and ends with electrotechnical components including auxiliary switches and timing relays.

The browser-based application with a central web server doesn't require any installation and can be used directly in the workshop, such as on a tablet computer.

PRODUCT SPOTLIGHT

INTEGRATED POWERFLEX DRIVES AND MOTOR CONTROL CENTERS

Real-time predictive analytics, operational intelligence and high-performance motor control are key to boosting uptime. The **CENTERLINE® 2100 motor control center** (MCC), configured with a new **PowerFlex® 755TS** VFD from Rockwell Automation, delivers these solutions.

The MCC provides power and process control in one centralized package. By integrating motor control and power in an MCC, manufacturers increase safety, productivity and reliability. Remote monitoring and control features enhance safety to help protect personnel and equipment.

The PowerFlex 755TS drives are built with TotalFORCE® control technology, delivering real-time predictive analytics. Adaptive control and high-performance motor control keep operations running at peak performance.

Multi-Product Calibrator

The Fluke Calibration 5560A Multi-Product Calibrator from Technology Partner **Fluke Corp.** allows technicians to calibrate more devices with a single calibrator and at a greater accuracy, up to 6.5 digits. The 5560A, along with the new 5550A and 5540A multi-product electrical calibrators, provide broad electrical workload coverage.

The 5560A features a 17.8-cm (7-in.) GUI with intuitive menus that are easy to navigate and read. The new interface provides access to common functions with the touch of a finger, eliminating menu scrolling. The screen displays all the information technicians need for each parameter being calibrated with color-coded fields that make it easy to see where to enter data.

Industrial Beacons

The **Bulletin 855R industrial beacons** from Rockwell Automation are designed to improve how industrial operators deliver warnings and status indications to workers on the plant floor.

A single beacon can offer both audible and visual indication, which can help prevent confusion on the plant floor in the event of a critical machine or equipment condition alert. And with multiple light-pattern options and multiple mounting options, the beacons can be used for a diverse mix of signaling applications.

Maintenance-free LED technology helps reduce maintenance costs. They can also drive down inventory costs by using one beacon family to signal up to three different machine or equipment conditions.

PRODUCT SPOTLIGHT

ELECTRICAL ENCLOSURES AND AIR CONDITIONERS

Technology Partner **nVent HOFFMAN** introduces its Extreme Environments line of stainless-steel enclosures and air conditioners. The line is designed for durable, reliable long-lasting protection of critical controls and equipment in demanding environments. They are ideal for water wastewater, oil and gas, offshore/coastal, petrochemical, pharmaceutical, mining and other extreme environments.

The enclosures meet UL Type 4X, IEC IP66 and IP69 ratings to protect electrical, data and control mechanisms from corrosives, wind-driven water, broad temperature swings, humidity and UV rays.

Rated for IEC IP66, IP69 and IP69K, the air conditioners offer high ingress protection to prevent water and particulates from entering, keeping critical components inside safe and avoiding unnecessary downtime.

Get to Know Our System Integrator Partners

Johannes zu Eltz

VICE PRESIDENT
GLOBAL MARKET ACCESS

ROCKWELL AUTOMATION

In this third of a series on "Getting to Know the Rockwell Automation PartnerNetwork," I continue sharing how the PartnerNetwork™ programs serve as a foundation for mutually beneficial business outcomes for both customers and our partner ecosystem with our best-in-class Rockwell Automation system integrators.

World-Class System Integrators

The global digital transformation (DX) market is growing, but while some organizations have already implemented or are in the process of implementing DX solutions, other firms have avoided the process for any number of reasons, including experiencing pilot purgatory or disorganized resources and systems.

Regardless of where organizations are in the process or how and when they got there, DX is critical for manufacturing industries to remain competitive and profitable. Using networks, automation, data collection/processing/management, analytics, and artificial intelligence (AI) can dramatically improve everything from an organization's finances to its safety and compliance.

Having the right system integrator in place to provide support for everything from design and implementation, to project management and maintenance, is critical to long-term success.

The Rockwell Automation community of more than 3,700 best-in-class System Integrator Partners provides innovative solutions for control, power, process and information applications to keep processes online and in production by leveraging our broad portfolio of products and services.

End-user customers rely on the technology the System Integrator Partner delivers to be of the highest quality, and their services and solutions to be trustworthy and reliable.

A Step Above the Rest

Rockwell Automation has a well-established brand and reputation in the industry for achieving successful outcomes for our customers. We partner with system integrators committed to delivering the best technical solution using Rockwell Automation technologies, along with a first-in-class customer experience.

Our System Integrator program is designed to educate and produce the most qualified system integrators that are committed to enhancing their competencies and capabilities, all with the goal of helping develop the best possible solution with the least amount of risk for customers.

The Rockwell Automation System Integrator program is tiered into four levels — bronze, silver, gold and platinum — that reward for sales success, capabilities and

collaboration with Rockwell Automation. Each tier offers differentiated benefits to help our system integrators maximize value. Obtaining recognition in each tier is based on three criteria:

1. Sales Success. The program focuses on establishing strong business relationships and rewards system integrators as they grow their business and achieve the revenue milestone associated with each tier.

2. Capabilities. We know the importance of technology expertise, so our program is centered around the technology disciplines system integrators can leverage to deliver business solutions in the areas of control, process, power and information solutions.

To help achieve success, we offer on-demand and in-person training materials and support to build competency in capabilities that best fit markets and industries they serve.

3. Collaboration. Rockwell Automation helps our system integrators grow and advance by collaborating on strategic initiatives and other mutual areas of partnership focus. This identifies areas of improvement, establishes business objectives, determines growth opportunities, and develops competency plans to enhance technical expertise.

Want to be a System Integrator Partner?

As a Rockwell Automation PartnerNetwork member, you can use the global reach of our ecosystem to differentiate yourself in the marketplace. We can help you enhance your visibility, and we can solve customer issues together.

The System Integrator Partner Program provides program participants with an opportunity to collaborate commercially and technically to increase new business opportunities, increase market awareness, expand into new market sectors, and improve technical competency in applying Rockwell Automation products and solutions.

Better Together

Rockwell Automation believes *We are Better Together* — and we do our part by delivering an expansive, global partner ecosystem of market-leading technology, excellent support and services, and an integrated and streamlined approach to business.

Customers can succeed on an international scale by using our network's breadth of innovative technologies and services that no single vendor can provide alone. We offer end-to-end solutions built in-house and by our selective, yet vast partner ecosystem, tailored to address your unique business challenges.

Together with our expert support, a commitment to simplifying your experience and a global community of partners dedicated to your success, Rockwell Automation stands out in our ability to help empower your business.

Learn more about System Integrators in the Rockwell Automation PartnerNetwork at http://rok.auto/systemintegrator. ●

INTERESTED IN JOINING THE ROCKWELL AUTOMATION PARTNERNETWORK?

If your organization is interested in becoming a company in the Rockwell Automation PartnerNetwork™ program and helping customers with your exceptional knowledge and service, you can leverage the global reach of our ecosystem to differentiate yourself in the marketplace. We can help you enhance your visibility, and we can solve customer issues together.

Learn more about members in the Rockwell Automation PartnerNetwork program, including how to become part of our partner community, at **http://rok.auto/partnernetwork**.

SPICE IT UP

See how a standardized digital solution helped a food ingredients manufacturer achieve better control and predictability by using smart manufacturing.

ARTICLE BY

Jim Bresler

DIRECTOR OF PRODUCT MANAGEMENT, FOOD & BEVERAGE, PLEX, BY ROCKWELL AUTOMATION

Take a bite of spicy BBQ chicken wings, a savory sloppy joe, or — for vegetarians — some zesty BBQ-glazed veggies, and you might discover that this explosion of spices, herbs and other flavors comes from the ingredients produced at OWS Foods of Concordia, Missouri. The company develops and makes sauces, rubs, blended seasonings, dressings, baking mixes and more for food manufacturers and restaurants.

When founded, the company only produced dry blended spices. However, through both internal product development and acquisitions, OWS Foods expanded to new products and markets.

With this growth, OWS recognized a need to implement a comprehensive digitized solution to help increase production efficiency and provide better control and predictability while maintaining their high quality standards.

Expansion Challenges

In 2021, the company acquired Ponca City, Oklahoma-based Head Country Bar-B-Q, which makes barbecue sauces. The acquisition brought together OWS' dry manufacturing capabilities with Head Country's wet-ingredient manufacturing.

OWS Foods' dry manufacturing process uses a split-by-batch operation with nonfixed sizes, so operators can include variation based on the product they're pulling. However, wet manufacturing uses fixed batch sizes, and ingredients are crushed and mixed into a slurry as opposed to a dry powder. This lets the operation and product be scaled based on demand.

Bringing new wet manufacturing facilities online required different raw-materials supply chains and new machines. This product expansion and overall business growth brought new operational challenges, prompting OWS to search for a unified system to implement across its facilities.

Scalable Holistic View

The search led company leaders to the enterprise-wide deployment of a cloud-based manufacturing execution system (MES) from **Plex**, a Rockwell Automation company. Implementation would allow OWS to increase their total production efficiency while continuing to meet customer demand.

OWS Foods uses Plex MES with emphasis on quality control capabilities to manage lot tracking, batch management and production planning company-wide.

The digitized solution tracks in-process quality and reduces waste resulting from manual errors and problems caught after the fact, along with verifying alignment with industry standards and guidelines.

"We run operational implementations, change management and integrations of acquisitions into our ERP systems for full traceability," says Christopher Marks, ERP manager, OWS Foods.

On the shop floor, Plex lets operators make educated decisions based on what the system is telling them. The comprehensive, real-time view of production has broken down the silos across facilities and now is the single source of reliable data.

"Plex is part of our enterprise PCN (process control network) structure and has done a great job of providing a holistic view of our business from accounting to raw materials, to quality, to SPC [statistical process control] check sheets to EDI [electronic data interchange]," Marks adds. "That scalable structure gives us the ability to bolt on additional manufacturing facilities as we grow."

Batch management has allowed more flexible scheduling of production and has increased focus on optimization, making OWS Foods much more efficient. "The more that we can schedule through Plex, the more effectively we can run the lines and meet our customer demand," says Marks.

> **"The production reporting capabilities, as well as total lot traceability using the lot management system, have greatly improved production and safety.**
>
> Christopher Marks, ERP Manager, OWS Foods

PODCAST

Effective Strategies to Deal with the Skilled Worker Shortage

*** Award of Excellence Winner for Best Podcast, 2022 APEX Awards of Publication Excellence.*

In our award-winning "Automation Chat" podcast, find out how technology, upskilling and reskilling are 3 keys to increasing productivity. Guests Dave Vasko from Rockwell Automation and Plex's Jerry Foster chat with *The Journal*'s Executive Editor Theresa Houck, and also explain the need for soft skills like problem solving and adaptability to handle evolving technology and business conditions.

Listen on your favorite podcast app or on the web at **http://bit.ly/405sewJ**.

Easing Supply Chain and Workforce Woes

OWS also deployed Plex Demand-Caster supply-chain planning into their facilities. This allows companies to effectively manage and plan for cross-facility inventory procurement.

This was critical as the company navigated the pandemic's impact on food supply chains and continued to adjust to the acquisition of Head Country Barbeque. Mature planning and forecasting capabilities have helped differentiate its business and accelerate growth, because reduced inventory equals lower costs and higher service levels for customers.

With an easy user interface aiding in adoption, OWS has an in-depth view across their existing and new facilities. Their focus on both technical and organizational change management confirmed Head Country Barbeque employees felt fully integrated into the OWS Foods enterprise and culture, reaping the productivity benefits of Plex quickly.

As a result, OWS was able to get the newly acquired facility fully operational within 6 months, including launching batch and lot management tools.

"The biggest benefits have been the total lot traceability throughout the system and the total productivity, efficiencies, and scaling capabilities with the batch management. The production reporting capabilities, as well as total lot traceability using the lot management system, have also greatly improved production and safety," says Marks.

He also notes they've had "great user adoption" because of the front-end work they did with batch management and how they utilized the system. Marks says little has changed for the operators, a key driver in the integration along with production efficiency.

Now that OWS Foods has laid the foundation with a smart manufacturing solution, they can more confidently grow the company, scaling quickly for continued success. ●

Insights into Medium Voltage Drive Cables

Learn technical considerations for choosing cable for low voltage and medium voltage variable-frequency drives, and how cable affects motor performance.

ARTICLE BY

Steve Wetzel

TECHNICAL SALES MANAGER FOR AUTOMATION PRODUCTS, SOUTHWIRE COMPANY

There's been much discussion about which cable to use between a variable-frequency drive (VFD) inverter and the motor. Most conversation has focused on low voltage drives — drives rated under 2,000V. But what about medium voltage drives? They need cable too. Let's look at those.

Most medium voltage drives use the same basic technology as low voltage drives: the insulated gate bipolar transistor (IGBT), a voltage-sourced device. Most, if not all, of today's low voltage drives rely on IGBT technology. It's a fast device with rise times in the tens or hundreds of nanoseconds.

EDITOR'S NOTE: This article is adapted from the white paper, "Medium Voltage Drive Cables," from Southwire Co. Download the full paper at https://bit.ly/tj0423wpso for comprehensive information about the difference between low voltage and medium voltage drives and cables, grounding considerations, and how that impacts motor performance. Also, learn about 4 key characteristics needed for a low voltage drive system's inverter to motor cable, and how that compares to medium voltage drives.

PODCAST

Proper Termination & Grounding of VFD Cable Shields in the Field

*** Award of Excellence Winner for Best Podcast, 2022 APEX Awards of Publication Excellence.*

In this episode of our award-winning "Automation Chat" podcast from *The Journal From Rockwell Automation and Our PartnerNetwork™* magazine, Executive Editor Theresa Houck talks with Brad Pollard, VP of Sales for Automation Products and Steve Wetzel, Senior Product Engineer at Southwire Co. Learn best practices for terminating and grounding the shield of a VFD cable in the field, and how to ground cables at intermediate termination boxes.

Also, discover the common questions they get from electrical contractors in the field, and find out what Rockwell Automation recommends for terminating VFD cables.

Listen on your favorite podcast app or on the web at **http://bit.ly/401aeSV**, or watch their chat on YouTube at **https://youtu.be/jLPqLVvwMRg**.

The IGBTs are located in the drives inverter section and allow the drives to create an output of Pulse Width Modulated (PWM) waveforms. These waveforms look like a series of square waves of different wavelengths. They trick the motor into thinking it's seeing a waveform of a different fundamental frequency than the 60 Hz traditionally used. IGBT-based drives offer many benefits like increased efficiency, better control, lower cost and reduced drive size.

But remember, the motor is no longer seeing a sine wave. It's now seeing a PWM waveform, which, along with advantages, has drawbacks, the main one being lots of high-frequency components.

IEEE papers tell us that, when you add up all the frequencies involved with the drive and their harmonics, these waveforms have frequency components up to and more than 30MHz. It's because of these high frequencies in the voltage's output that VFD cables were created, and why their use can mitigate a variety of drive system issues.

In the past, VFD cables weren't required in medium voltage drive systems because they used a different technology — a current-sourced topology using something like a silicon-controlled rectifier (SCR), symmetric

gate commutated thyristor (SGCT) or other device in the thyristor family.

Each drive topology — current-sourced or voltage-sourced — has its own strengths and weaknesses. Current-sourced medium voltage drives, which were once standard, don't create the high-frequency PWM waveforms that low-voltage IGBT drives do.

Many medium voltage drives use the same IGBT technology found in low voltage drives. That means the medium voltage drives experience similar system challenges as low voltage drives. Most drive manufacturers have focused development on these newer technology IGBT medium voltage drives, and many have discontinued their current-sourced medium voltage drives.

In a low voltage drive system, ideally, you want your inverter-to-motor cable to have the following characteristics:

1. Three copper phase conductors.
2. A thermoset insulation like ethylene propylene rubber (EPR) or cross-linked polyethylene (XLPE). Not polyvinyl chloride (PVC) insulation, which Type THHN cables have.
3. An overall metallic shield.
4. Three ground wires in the interstices of the three-phase conductors.

Let's take a snapshot of each item (details are available by downloading our white paper):

1. Three Copper Phase Conductors

Many low voltage drives use terminals designed to be used with copper wire. If you use aluminum wire, the connections can loosen and cause premature equipment failure.

In medium voltage drive systems, there are no terminals in which to plug the cable. Medium voltage cables must be terminated with medium voltage termination kits. During this process, a lug will be installed on each phase conductor. This allows for the use of either copper or aluminum conductors, and the cable stranding can be either compact, compressed or concentric.

Medium voltage drives give you more flexibility when it comes to choosing the cable's conductor. While you have wide latitude in using copper or aluminum and various types of stranding, one area you will want to pay a little more attention to is the number of conductors. Medium voltage cables are manufactured with either a single conductor or with three conductors.

2. Thermoset Insulation

Low voltage drives can create reflected or standing waves due to the fast rise times of the square waves they produce. Rise times can be faster than 100 ns. These reflected waves are caused by the impedance mismatch between the motor's surge impedance (which is high) and the cable's surge impedance (which is low).

WHITE PAPER

Medium Voltage Drive Cables

Visit **https://bit.ly/tj0423wpso** to download the full white paper, "Medium Voltage Drive Cables," from Southwire Company. Get comprehensive information about the difference between low voltage and medium voltage drives and cables, grounding considerations, and how that impacts motor performance. Also, learn about the 4 key characteristics needed for a low voltage drive system's inverter to motor cable, and how that compares to medium voltage drives.

Most medium voltage drives use the same basic technology as low voltage drives: the insulated gate bipolar transistor (IGBT), a voltage-sourced device.

In medium voltage cables, PVC is not allowed to be used as an insulation compound; only thermoset insulations are allowed. This is ideal for VFD applications.

3. An Overall Metallic Shield

Almost all low-voltage power applications use unshielded cable. Because the low voltage drives generate high-frequency PWM waveforms, electromagnetic interference (EMI) is generated and can cause interference of plant control and communication systems operation. The best way to mitigate EMI is to use a shielded cable.

Medium voltage cables aren't constructed with an overall shield, but they're required to have a shield over each insulated conductor. EMI emitted from that conductor is controlled when that shield is grounded, which is required by code. Because these individual conductor shields mitigate the majority of EMI generated, no overall shield is required.

4. Three Symmetric Ground Wires

In low voltage cables, each phase current induces a voltage in the ground wire(s). If the ground wire is part of a circuit (which it is), it will have a current flowing in it. By having a cable with three grounds placed symmetrically in the interstices of the phase conductors, some very nice cancelation effects occur that minimize that ground current.

Medium voltage cables typically don't have three grounds, but they have something low voltage cables don't have: their individually shielded conductors. These shields create their own symmetry, and the same cancelation effects happen within these shields as happens in the three grounds in a VFD cable. ●

SOUTHWIRE COMPANY With global headquarters in Carrollton, Georgia, Southwire is a Rockwell Automation Technology Partner. The company manufactures electrical wire and cable products, and has corporate divisions that include Industrial, OEM, Energy and Electrical.

10 Tips for Secure Remote Access to Control Systems

It's important to set up remote access for both security and availability needs to get the most benefit while mitigating cyberattack risks.

ARTICLE BY

HMS Networks

Remote access provides the ability to remotely connect to intelligent devices such as programmable logic controllers (PLCs), human-machine interfaces (HMIs) or robots, with similar functionality as if being on-site with those devices. The resulting cost savings, and ability to act immediately when a machine fails, verifies that machines are working at their maximum level of productivity.

Here are 10 tips for establishing secure remote access to a control system. Consult your automation suppliers to fully understand the intrinsic security of your system.

1. Remote Access Should be Granted for Machine Service, but Segregated from the Plant Network

OEMs should only reach the machines under their responsibility in the plant. To achieve this, the system must be configurable to segregate the machine network from the rest of the network. Once completed, the machine network nodes aren't directly connected to the site network and must be configured with different IP addresses.

2. Separate VPN Access from Machine Control to Verify Performance in Event of a Cybersecurity Incident

Using machine control equipment, such as a PC, HMI or PLC, as a VPN host may reduce its resources and degrade performance. To achieve the control system's availability, it must provide the resources to operate in a degraded mode during a denial-of-service (DoS) event.

An external router will act as boundary to filter certain types of packets to protect control systems from being directly affected by DoS events, thus avoiding any external attack affecting the control system and stopping the machine.

VIDEO

High-Speed Remote Monitoring Enabled by 5G Wireless

In this video, Theresa Houck, Executive Editor of *The Journal From Rockwell Automation and Our PartnerNetwork*™ magazine, interviews Rob Lodesky from HMS Networks as he demonstrates the 5G Anybus Wireless Bolt, providing high-speed Internet access for industrial machines in a robust, innovative form factor. 5G allows use of protocols users typically can't use via wireless, like CIP Safety™ and CIP Security™, and enables remote system monitoring and analysis. It works in harsh industrial environments.

Watch the video at **http://bit.ly/3iAR9qD**.

3. Avoid Internet or Public-Facing IP Addresses on VPN Routers

Router IP address must be hidden from the public to prohibit hackers from easily scanning for potential targets. So, use only private VPN addresses to connect to the router instead of public IP addresses.

However, the router will still have a hidden IP address accessible through the Internet. If the router is configured to use Internet access through a cellular modem, then the WAN connection is equivalent to the cellular connection, thus putting the public IP address out on the Internet.

4. Allow Only Outgoing Connections from Trusted to Untrusted Zones

No inbound firewall ports must be exposed on the Internet, and no static Internet IP addresses should be required.

The industrial router initiates an outbound secured VPN tunnel point-to-point with a specific account in the cloud. This tunnel is authenticated and encrypted via HTTPs and goes over the corporate network and through the firewall (outbound only). Once online, it travels to the cloud network along with remote access services.

5. All Traffic Must Be Encrypted

Remote support users connecting over the Internet should use a strongly encrypted protocol, such as running a VPN connection client, application server or secure HTTP access, and authenticate using a strong mechanism, such as a token based multifactor authentication scheme.

For encryption, public certifications from commonly accepted standards and guidelines must be used, such as the Internet Engineering Task Force (IETF) Request for Comment (RFC) 3647 for X.509-based PKI (Public Key Infrastructure of 2048 bits).

6. Update Devices with the Latest Official Firmware and Security Patches

This is in accordance with the device manufacturer recommendations. Also, you can be notified by the ICSCERT (Industrial Control Systems Cyber Emergency) about vulnerabilities found in industrial automation equipment and receive recommendations of required patching as well.

Because the systems included in a remote access solution — router and cloud services — aren't

always critical and are most of the time disconnected, it's not necessary to follow specific system upgrade policies other than those recommended by the manufacturer. For example, the upgrade can be done at any moment the remote access is not being used, as it will not affect the availability of the machine in any case.

which case the system administrator should change the credentials immediately).

9. Firewall and Filter at Higher Level

Access to a device's IP address and ports should be restricted by configuration. This includes limiting a user's access to both Ethernet and gateway services. This filtering should happen outside the router itself.

7. Be Able to Fully Reset to Factory Settings

Your router must be ready to accept a reset to the factory settings, including password, device identification, user Web site, LAN IP address+ mask, Internet access, Modem/WiFi settings, and cloud and Proxy access configuration. In cases where strange behavior is detected, the device must be fully restored to factory settings.

8. Use Multifactor Authentication Whenever Possible

Multifactor authentication (MFA) should be considered among the best practices in remote access, because it provides an added layer of security.

Passwords can be discovered or stolen. If the system requires us to enter a second code of single-use from an SMS sent to our mobile phone, the stolen password itself becomes worthless (unless our cellphone also has been stolen and has no protection code, in

10. The Connections and Changes Must be Auditable

The system must be capable of logging events on access control, errors, operating system, control system, backup and restore, configuration changes, potential reconnaissance activity and audit log.

Individual audit records should include the timestamp, source (originating device, software process or human user account), category, type, event ID and event result.

Value

Remote access can provide clear advantages for a business, but it must be done with careful security considerations to limit the risk and consequence of a cyberattack. ●

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