PROCESS INSIGHT SOLUTIONS

OCTOBER 2021

INDUSTRIAL AUTOMATION

ESTABLISHING FUNCTIONAL SAFETY PLANNING

INNOVATIONS IN LEVEL CONTROL

ENSURING BACKUP POWER

SCALING UP GREEN HYDROGEN

FESTO EMERSON WAGO REGHNER IPPT CANADA'S PROCESS NETWORK

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The automation of the industrial sector is about quickly and easily adapting manufacturing capabilities to where they're needed, based on ever-shifting market demands.

Industry 4.0 and the Industrial Internet of Things (IIoT) are integral components to reaching this goal within the new industrial landscape – but the unique demands of industrial automation are not easily solved with commercial IoT solutions.

The "industrial" in IIoT spans a wide range of solutions, including tools that simplify instrument maintenance, extended-life batteries that enable remote wireless devices, and much more.

Finding the right solution to your individual needs can be challenging, but it has been made simpler with these tools and techniques from some of industry's IoT leaders in this sponsored ebook from IPPT.ca.

INDUSTRIAL AUTOMATION
Process Insight Solutions

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IPPT INDUSTRIAL PROCESS PRODUCTS & TECHNOLOGY
CANADA'S PROCESS NETWORK

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ESTABLISHING FUNCTIONAL SAFETY: PLANNING FROM THE GROUND UP

For safety systems designers and safety officers, particularly those in the petroleum and petrochemicals sectors, knowing the very detailed and exacting requirements for maintaining a safe operating environment is a must. For those in supporting positions, or anyone who could use a refresher, the design of effective and regulatory-compliant safety systems begins with a thorough understanding of the many standards and definitions involved and how they are applied to the physical design.

Any company with operations that potentially present a potential hazard for staff, local residents or the environment must minimize the risk present under fault conditions, meaning when something goes fails.

The foundation for the protective measures and redundancies put in place to guard against such events are the SILs (Safety Integrity Levels) determined for the various systems, which ranks safety threats from potentially capable of slight harm to capable of causing a catastrophic event. This is where the design of safety systems begins. The SIL establishes a relative level of risk reduction, setting a target level of reduction for designers. It creates a measurement of the probability of failure on demand (PFD) and is refined according to factors such as frequency of exposure time, potential for harm reduction and probability of occurrence. It is further shaped by breaking down the assessment risk by its potential imminence – the probability of failure per hour (PFH), which estimates the probability that a failure will occur during continuous use.

If the various factors that determine how a SIL is determined have you intrigued, and there are more below, by all means jump directly to our Festo whitepaper "An Overview of Functional Safety in the Process Industry" where each contributing element is explained further, as well as how these factors are synthesized to arrive at a final SIL determination.

TO DOWNLOAD THE WHITEPAPER, CLICK HERE.

This whitepaper also covers other system and component integrity values that are considered as part of calculating a SIL. These include the Safe Failure Fraction (SFF), Meantime Between Failures (MBF), Hardware Failure Tolerance (HFT), Device Types A and B, and the Failure Rate.

Functional safety systems to guard against these risks and reliability issues are created according to two standards: IEC 61508 and IEC 61511. The former is the basic standard for establishing functional safety on a systemic basis, covering electrical, electronic and programmable electronic safety-related systems and not on an individual component basis. It only applies to a complete Safety Instrumented Systems, or SIS.

Redundancy is a principal tool of an effective SIS. The greater the redundant protection, the more complex and expensive it usually is. The value is opaque; avoidance of accidents, serious damage and downtime. In petroleum, gas processing, petrochemicals and in the handling of other hazardous substances, the SIS architecture determination is critical for both safety and to protect operational reliability.

IEC 61508 and IEC 61511 recommend diverse redundancy to increase the safety integrity of programmable electronic system. SIS architectures, which progress from basic to most advanced based on the degree of redundancy, place process safety and reliability at the forefront of hardware design. In assessing possible SIS architectures, there may be some latitude in the degree of functional safety achieved – what's good, better and best – for given systems, leaving it up to operators to decide their own risk tolerance within the bounds of their environmental, social and governance goals.

The Festo directly controlled pilot valve VOFD for is used for demanding usage conditions with a redundant version for safety-related systems up to SIL3.

Designing and testing the system in either a new installation or retrofit is the final stage of the project. For a much deeper dive into the various SIS architectures as well as some examples of how they can be applied in a process setting, download "Functional Safety in the Process Industry", which touches in greater detail on all of the issues described above. **CLICK HERE.**

Two rugged pilot valves

Festo offers products and solutions that are ideal for implementing safety engineering in the process sector as easily and cost effectively as possible, like our VOFC and VOFD solenoid valves, designed for process automation. VOFC are special 3/2-way and 5/2-way valves and VOFD are 3/2 valves. In the chemical and petrochemical installations, both series are frequently used as indirectly controlled (VOFC) and directly controlled (VOFD) pilot valves for butterfly valves and actuators. Their sturdy design and high resistance to corrosion make them suitable to outdoor use. With the flange pattern to NAMUR, these valves are particularly suitable for quarter turn actuators. Both can be used in emergency shutdown applications and are suitable for use in safety-related systems up to and including SIL3 as per IEC 61508. Variants are available with ATEX explosion protection.

Festo
www.festo.ca

FESTO

Functional Safety Solutions

for the Process Control Industry

Festo solenoid pilot valves are an integral part of the final control element in any emergency shutdown system. To reduce downtime, critical applications require an individual 3-way pilot valve, or redundant pilot valve systems, or even modular systems complete with manual override systems.

Learn more at **www.festo.ca**

DIFFICULTIES AND INNOVATIONS IN LEVEL CONTROL

Company Details

Over 50 Years In North America

Rechner Sensors has proudly served the North American market for over 50 years. We have helped provide specialized sensors for many demanding industrial automation applications. Rechner Sensors has played a major role worldwide in the development and design of capacitive sensors through dedication, product innovation, and top quality. Innovation that is primarily led by application driven custom solutions.

Capacitive Sensors: A Quick Overview

Capacitive Sensors and Material Dielectric

Rechner Sensors specializes in capacitive sensors for level control applications. Capacitive sensors detect liquids, powders, or solid materials by measuring a change in capacitance. The amount of change in capacitance is dependent on the dielectric constant of the material being sensed. The larger the dielectric constant, the easier the material is to detect. This means that materials with a high dielectric constant can be detected at greater distances than materials with low dielectric constants. Also, materials with high dielectric constants can be detected through the wall of containers made of material with a lower dielectric constant. For example, water (with a dielectric constant of 80) can be detected through a sight glass or the wall of a glass container (with a dielectric constant of 4 to 10).

Standard Rechner capacitive sensors can detect materials with a dielectric constant of 1.2 or greater. Special capacitive sensors can even detect materials with a dielectric constant down to 1.1. The dielectric scale ranges from 1 to 80. Air has a dielectric constant of 1 while water has a dielectric constant of 80.

Media Optimized Sensors

Rechner High-Performance capacitive sensors include a design principle that we named 'media optimized' sensing. This term refers to the ability of our HP models to detect a wider range of dielectric materials at an adjustment setting. Rechner understands that materials used in factories are not always uniform at the customer's production facility. Materials between batches (and even within the same batch) can vary in size, density, and temperature. With media optimized sensor models it is also possible to be able to detect a wider range of different products at the same adjustment (e.g., different types of plastics).

Sensor Design

Level Sensors and proximity sensors are often grouped into two categories: flush (shielded) and non-flush (non-shielded). Both types can be used to detect products at a distance or in direct contact with the sensor.

Flush mount sensors can be mounted flush with the side of a container and are shielded on their sides. These sensors do not detect at their sides. They only detect straight ahead. The benefit of flush mount sensors is the highly directed sensing field.

This allows sensors to be embedded in metal frames. As the name implies, they can be mounted flush with the surface of a metal wall.

Non-flush sensors detect at their sides as well as in front. The benefit of a non-flush sensor is a larger sensing field and farther sensing distances. These sensors must have clearance from metal parts inside the wider sensing field.

Adjusting a Sensor

The standard method for adjusting a capacitive sensor is by adjusting a potentiometer on the sensor. Rechner models use a 20-turn potentiometer instead of a ¾-turn potentiometer for 25 times more accurate adjustment. New innovations in electronics now allow for automatic teaching methods.

Adjusting with Easyteach

Rechner's EasyTeach technology can program a sensor automatically. Just place the sensor in the product you wish to detect and press a button until the sensor's indication light flashes. This process can also be done remotely by wire.

Level Sensing

Choosing a Level Sensor

Sensor design plays a critical role in industrial automation applications. Sensors are often designed to be the most reliable for only the applications they are intended to be used.

When choosing a sensor for the highest reliability then a test for the worst-case scenario should be performed. The worst-case scenario can of course be mitigated. The worst-case scenario can be lessened by implementing proactive measures that prevent some scenarios from happening.

Having a clear idea of failure scenarios is the first step. We should also understand how close to each failure mode our implementation is. For example. How much material can build up on a sensor before a false signal is generated.

The Cost of False Signals

Increasing reliability for sensors primarily means reducing false signals. This includes false signals OFF (the sensor not detecting the product when it should be), false signals ON (the sensor detecting product when it should not be), and premature sensor failure.

A false signal OFF will cause an overfill situation. Overfills are dangerous to people and they contaminate the production facility. This may incur costly cleanup of the overfill area.

False signals ON will cause an underfill situation. Underfills can cause elevated temperatures or fires in applications where heating elements are used.

A sensor failure may cause an overfill or an underfill situation depending on how the sensor failed.

False signals can cause injury to employees. Overfilled material can be slippery, hot, or cause chemical burns.

Overfills also have a monetary cost for clean-up. Machines need to be shut down and reports filed. This downtime can easily cost tens of thousands of dollars per hour. Overfills can also have an environmental impact. If your company has an environmental policy, overfill protection may be a process that should be reexamined for a greener outcome.

Material Build-Up

Empty Tank Vs Clean Tank

When considering a level sensor, taking the difference between an empty tank and a clean tank into account is critical. A clean tank is empty, but an empty tank is not always clean. Even smooth stainless-steel tanks only dealing with liquids must undergo regular sanitization processes. Some materials will leave behind more residue than others. Dust and viscous liquids will collect on even the smoothest of surfaces. This should be taken into consideration when choosing a sensor.

Residue

Residue will usually be left behind inside of the tank in any process that requires a tank to be emptied and refilled. Residue left behind can accumulate over time on the surfaces of the tank and on the level switch. This residue can be liquid, bulk solid, or powder.

In general, capacitive sensors with larger sensing fields can ignore more buildup of material without creating a false ON signal.

Hygienic Design

What is Hygienic Design?

Hygienic design is a set of principles and standards that reduce the risk of food safety issues. The most important factor in hygienic design is that the equipment and premises be easily cleanable.

Standards for hygienic applications have increased in recent years. Rechner Sensors now tracks from start to finish the materials used in each sensor from raw to the final sensor serial number. During production special gloves are used to handle all sensors that are to be used in hygienic applications. The surface finish of sensors for hygienic applications are tested to ensure they meet cleanability standards. The most common materials used for hygienic designs are PTFE and PEEK.

Rechner has sensor models that meet IP69K standards. The IP69K standard requires that the sensor be sprayed with water at a pressure between 1160 and 1450 PSI and at different angles without damaging the sensor.

Integration of Hygienic Design Sensors

When dealing with hygienic design, it is just as important to consider the integration of the sensor into the process as it is to consider the design of the sensor. Incorrect mounting hardware can leave gaps, create crevices, or expose threads that become a place for bacteria to collect, avoid cleaning/sanitization, and grow.

Cleaning Shadow

Large sensors can cause unintended issues regarding material build-up. Water coming from a point source will create a cleaning shadow that prevents proper cleaning on the far side of an object blocking the water. The larger the object blocking the source, the larger the cleaning shadow will be.

EHEDG Vs 3-A

Rechner has EHEDG certifications for sensors. This certification requires that design principles be followed as well as a certification test be passed. The 3-A website has a harmonization matrix for EHEDG products that comply with 3-A standards.

Sensors in Contact With The Product

In industrial automation, there is sometimes an aversion to sensors being in contact with the bulk material. A sensor being in contact with the material does not diminish the hygienic design of the sensor. A false signal causing an overflow or cause a tank to run empty is often a more serious hazard.

The most reliable sensor may be the model that is in direct contact with the product. With proper hygienic design and implementation: sensors, that are in contact with the material should not be dismissed.

Industry 4.0 - Increasing Productivity Through Increased Connectivity

Overview

Industrial automation has come a long way. From mechanization (1.0) to electrification (2.0) to automation (3.0) and globalization (3.5), we have arrived at 4.0: the digital manufacturing revolution. At the heart of Industry 4.0 is the idea that we can increase efficiency, reduce downtime, and improve quality by increasing information gathering and using computers to make our processes more efficient.

Future Technologies: Bluetooth, IO-Link

For us to gather more data, we need smarter sensors. New technologies like IO-link and BlueTooth have entered the mainstream. These technologies can now be found in Rechner model sensors. These technologies enable the possibility for two-way communication to the sensors. With this we can retrieve internal sensor data (like temperature) which allows us to monitor the health of the sensor. With IO-link, we can send commands to adjust or reprogram sensors remotely and automatically.

The Rising Demand for Analog Sensors

While not exactly a new technology, analog sensors have come a long way. From simple RC-circuits to new programmable IC-packages, analog sensors are easier to use than ever before. Output data from new analog sensors are more linear and less susceptible to electrical interference resulting in more accurate readings.

Integrating analog sensors has never been easier with the abundance of computers and PLC presence in modern factories. The demand for analog sensors has risen as such. Analog level sensors have some very interesting use cases.

Rechner offers analog level systems that are self-programming. No adjustment is necessary when a new material is used in a tank with a TrueLevel sensor.

Predictive Level

Analog level systems that tell you how much product is left in a tank can now be used with predictive software to plan further ahead. These analog systems allow the ability to track detailed usage over time. Usage over time can be used to predict when a vessel will be empty and when more product will need to be ordered. Usage over time also allows more short-term predictions, like when a batch will be finished. Maintenance and changeover teams can be scheduled more efficiently.

Point Level Use Case 4.0

An analog sensor detecting the point level in a tank may not appear to be useful at first glance, however it allows for more complicated processes since more data is being transferred. A single point level sensor with an analog output can distinguish between different types of materials. This type of sensor allows different processes to be carried out depending on which material is detected. A few examples will be given here.

In an oil sump application outdoors, three conditions are possible: The sump will be empty, the sump will be full of rainwater, or the sump will be full of oil leaking from a transformer. A single analog sensor can detect the difference between air, water, and oil. In the condition that air is detected the pump will turn off. In the condition that water is detected, the rainwater will be pumped out back out into the environment. In the condition that oil is detected an alarm is sent to the company so that proper environmental cleanup can be performed.

An analog sensor may also detect an empty tank, the foam buildup on the top of a product, and the actual liquid level of the product. You could also detect the cleaning product during automated wash cycles.

An analog sensor may also be used to detect a very wide range of products. In a condiment factory, many kinds of condiments or flavors of a single condiment may be processed it the same tank. An analog sensor could reliably detect the full tank and empty tank condition of many different products just by reading a recipe of analog values from the sensor into a PLC.

Call us at 1-800-544-4106 or visit www.rechner.com for more information.

Videos

Level Detection of Honey using the LevelMaster Sensor

Level Detection of Coffee

BlueTooth Sensor Detection of Viscous Products

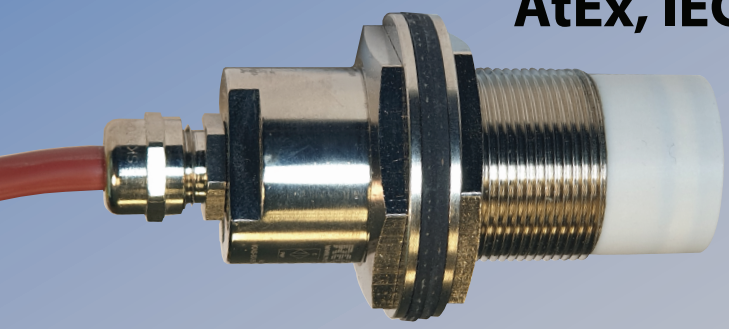
Documents

Highlights 2021

RECHNER SENSORS

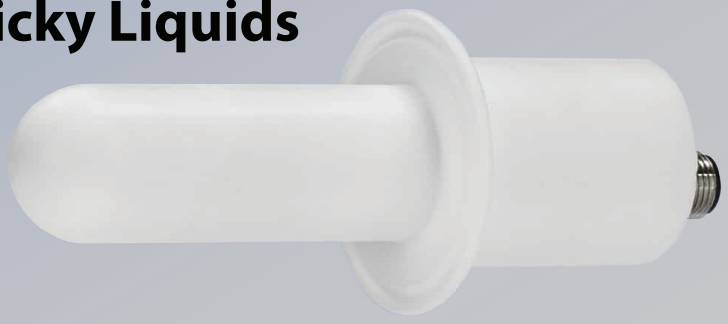
CAPACITIVE LEVEL CONTROL

AtEx, IECEx

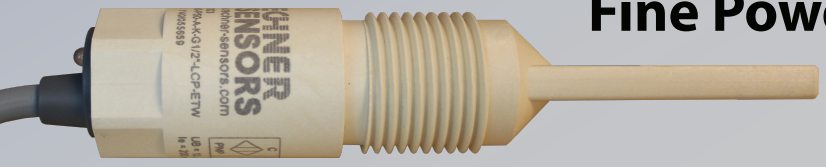


Analog Level

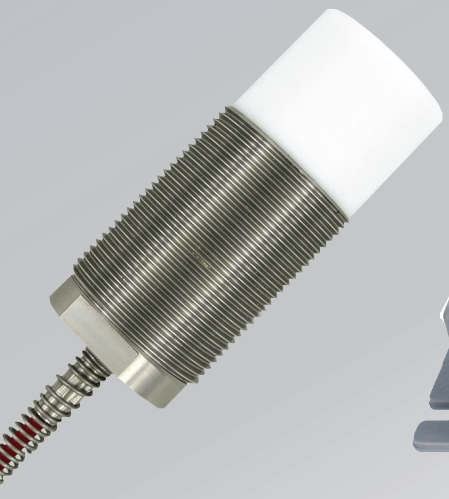
Tri-Clamp, Sticky Liquids



Fine Powders



482 Farenheit / 250 Celcius



www. rechner.com - 1-800-544-4106 - Milton, ON

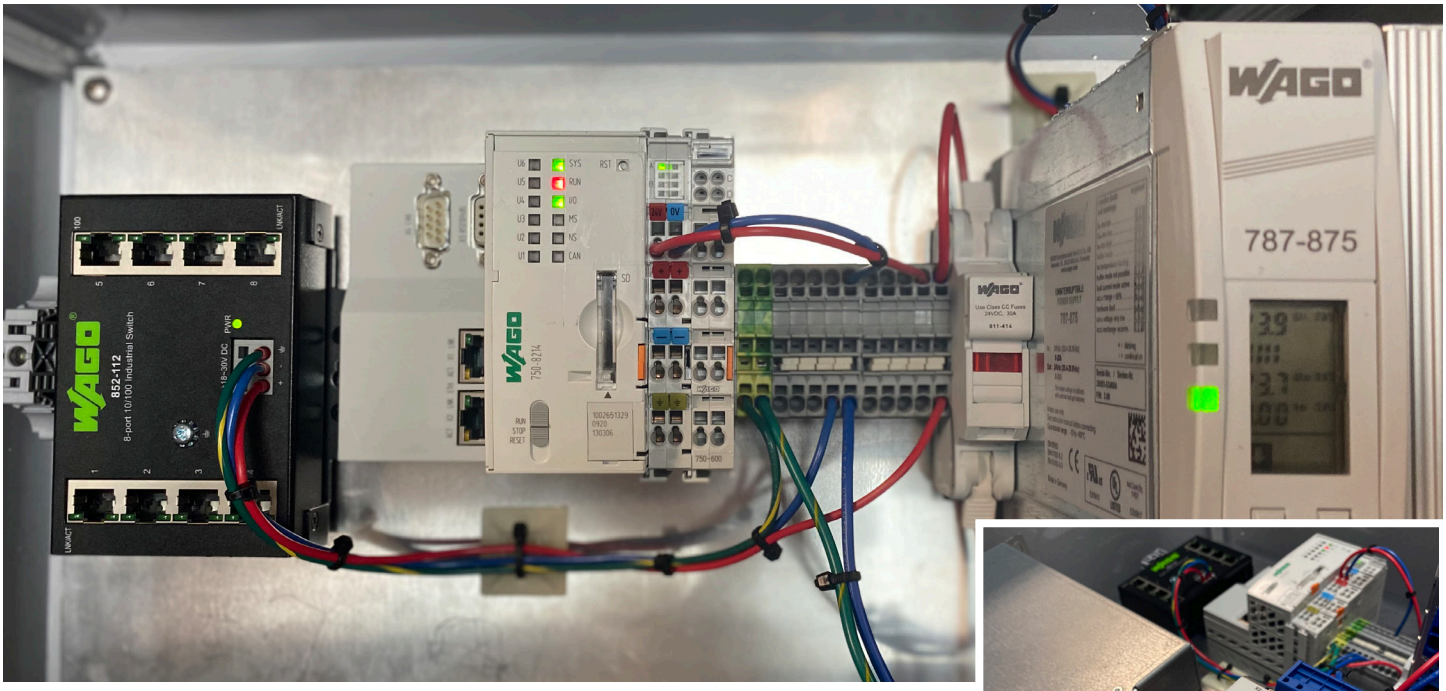
ENSURING BACKUP POWER IS THERE

The world continues to move forward in its search for quality energy alternatives. As these sources of energy advance, companies are looking to gain a foothold in renewable energy generation, storage and microgrid management. They seek advancement in technology that will not only provide for their specific needs, but also maintain a balance of cost effectiveness and competitiveness in the industry.

As a leader in global distribution of power products, CE+T America designs, manufactures and markets a wide range of backup power systems for commercial and industrial customers with specific design requirements. They manufacture smart power converters that are used in data centers, backup power applications, renewable energy integration (photovoltaic + Energy storage), microgrid and electric vehicle charging infrastructures. CE+T America also offers monitoring and control solutions for all of its power converters. Headquartered in Belgium and established in 1936, they started operations in the United States some time ago, but only recently opened their CE+T Power facility in Austin, TX in 2019.

In early 2020, CE+T America was developing their Maestro Power Management System (PMS). This PMS would manage their Stabliliti power converters that paired with Photovoltaic (PV) and energy storage, delivering considerable energy cost savings. The 3-phase system would target high-energy users where solar cannot, by itself, provide the necessary power due to peak demand, time-of-day or seasonal energy costs. CE+T America wanted to make sure all power flows were controlled in real time, prioritizing PV over battery use when possible, combining PV and battery when necessary to offset energy costs, as well as charging batteries from PV or grid to further optimize savings. CE+T's Maestro PMS microgrids (off-grid systems) would also utilize this PV-first algorithm, minimizing battery use while the sun is shining and making load support the first priority while also extending the life of the batteries.

In order to make this happen, CE+T America sought out PLCs, main and uninterruptible power supplies and Ethernet switches. "First, we were looking for an affordable, feature-rich programmable logic controller (PLC) to be used in control applications like the one required for this power management system," said Govind Mittal, Director of Grid Edge Software for CE+T America. Overseeing development and being the product owner for the power management system, Mittal also wanted to make sure the products he would be using would come with high-end technical support in case he needed help



troubleshooting any issues within his PMS.

After a lengthy online search, Mittal came across a few businesses that caught his eye. One of those was WAGO, a German-based industrial automation company with its North American headquarters located in Wisconsin. Mittal placed a call to WAGO's Regional Sales Manager for Central, South and West Texas, Jeff Wittorf, to find out what offerings WAGO could provide. "Govind told me about his immediate needs. That same day I provided some feature options and had product samples sent to CE+T the following week," Wittorf said.

Competing to provide CE+T America with the best that WAGO could offer, Wittorf enlisted the help of colleagues such as Chris Dunlap, WAGO's North American Energy Industry Manager. Dunlap was able to provide expert Energy Industry advice while comparing WAGO's value versus the competition. Kurt Braun, Applications Engineer and IIoT Market Specialist for WAGO provided technical resources, giving CE+T America visualization features as well as excellent examples with Modbus libraries to meet their requirements. He was also a great resource for any questions regarding Maestro's application design to fit within the WAGO system. Finally, WAGO Applications Engineer David Bae provided a continuation of knowledgeable support particularly when it came to utilizing Modbus communication through WAGO's e!COCKPIT software, firmware updates and web visualization. WAGO would also able to provide a PLC with a Linux operating system allowing CE+T to not only program the PLC using IEC61131-3 languages, but also allowing for open sourced coding within Docker containers.

All of this support ultimately helped Mittal's decision to go with WAGO. "Pricing and feature set was the main driver but what really made the difference was the exceptional sales and technical support," Mittal stated, "without this, I would have gone a different direction." Wittorf believes that this was the case as well. "Our difference maker is our people," he said, "our sales and industry management teams genuinely care about helping our customers."

Turnaround was very quick and the Maestro Power Management System was finished and ready for use in June 2020.

Today, WAGO continues to support CE+T America customer inquiries regarding the system and is looking into possibly deploying the program remotely, connecting it to WAGO controllers. Wittorf says that he stays in constant contact with CE+T America to ensure their needs are being met both for today and tomorrow. Mittal is excited for future endeavors, "The Maestro is in action today and we are expecting many deployments to customers later this year. We are using and will continue to utilize WAGO products in our power management systems".

For more information regarding CE+T America, please visit www.cet-power.com/en/

To find out more about WAGO, go to www.wago.us

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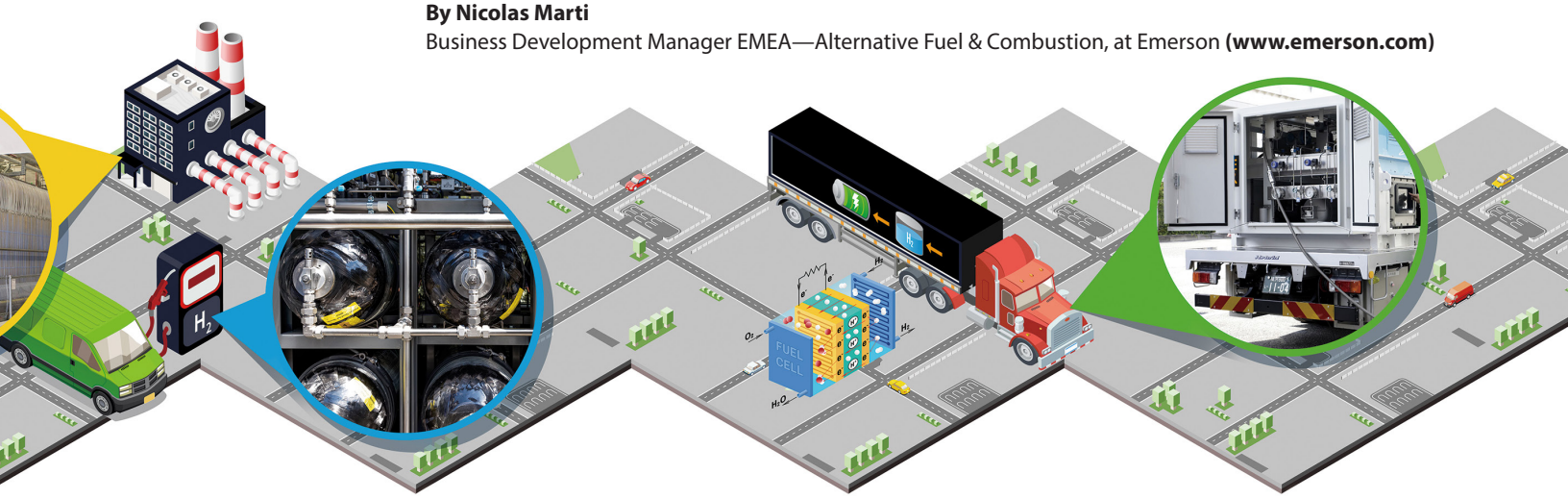
CONTROLLING MICROGRID SOLUTIONS:
Energy Storage and Microgrid Management

SUCCESSFULLY SCALING UP GREEN HYDROGEN ACROSS THE VALUE CHAIN

By Nicolas Marti
Business Development Manager EMEA—Alternative Fuel & Combustion, at Emerson **(www.emerson.com)**



From the electrolyzer, to the fueling station, to the fuel cells, it can be advantageous to work with a central trusted partner across the entire hydrogen fuel value chain.

Green hydrogen is proving to be one of the most viable global energy sources and a path to decarbonization. As global interest and investment in hydrogen-powered vehicles and power systems grow, the green hydrogen industry is poised to thrive. However, that success depends on reliable green hydrogen production, storage, transportation and dispensing. With the right solutions and processes in place across the supply chain, we can make a safe, efficient green hydrogen future possible today.

Creating a Zero-Emissions Future

What makes green hydrogen so attractive as a renewable source of energy is that it can provide sufficient, reliable universal power with zero emissions. Countries around the world have developed policies, programs and projects to accelerate green hydrogen production and use. Many governments have developed hydrogen road maps and are setting ambitious targets. Targets set by China, Japan and Korea will see over a million hydrogen-powered vehicles on the road by 2030. Canada has developed a hydrogen strategy with the goal of becoming net-zero by 2050. In the wake of these targets, projects have begun. Canada, for instance, has already become home to the world's largest green hydrogen plant, with plans for more to come.

Although projects have started, most of the infrastructure and processes required to support the transition to green hydrogen still need to be built, and scale-up remains a challenge. The good news is that technological solutions and digital transformation that have already been proven in related applications and industries, including the greater hydrogen industry, can help solve many of the challenges that companies across the value chain face now.

Production

The process of producing hydrogen using water and electricity is called electrolysis. Electricity breaks water down into its base elements, hydrogen and oxygen, in a unit called an electrolyzer. These electrolyzers can range in size from small devices to large-scale, central production facilities. For example, skid electrolyzers can be placed outside of factories to replace public utility electricity, or they can be used to power entire communities. By combining electrolytic cells and stacks, green hydrogen production can be scaled according to the needs of the application.

However, within the great advantages of scalable clean energy lie a few challenges. R&D efforts are currently being made to increase electrolyzer system efficiency overall, as well as electrolyzer operating life, power density and stack size. These improvements will reduce material costs and lead to more flexible systems adapted to intermittent and fluctuating power supplies.

Because of the great scalability of electrolyzers, manufacturers need to consider how they access the components necessary for the full range of electrolyzer sizes. The nature of hydrogen adds even more complexity. It's the smallest and the lightest element,

Key technology partners should have an extensive range of measurement, control and electrical equipment suitable for installation in hazardous areas of the electrolyzer. The benefit is safe, reliable and precise process control, with optimized production for the desired hydrogen purity.

and, if mishandled, consequences can be disastrous. Electrolyzer components need to be reliable and built for hazardous environments to keep people and property safe.

Working with a technology supplier that has an extensive portfolio specifically designed for hydrogen applications can simplify the supply chain, saving time and money. And, in many cases, it can be much easier to work with one supplier that has a complete portfolio, especially as companies scale their production. This frees up equipment manufacturers and producers to focus on developing and delivering their products.

It's especially important to work with an expert supplier equipped with a wide range of measurement, control and electrical equipment specifically designed to improve reliability and safety in the hazardous areas of electrolyzers. In addition to valves, valve systems, flow meters, regulators and pressure transmitters, they should also have smart technologies, such as scalable process control and safety solutions, that can reduce operational complexity, lower risk and improve the performance of green hydrogen facilities, from electrolyzers to Balance of Plant (BoP) assets, while providing sitewide safety system capabilities. An Integrated Control and Safety System (ICSS) is also a critical tool to ensure optimized start/stop sequencing with embedded sequence diagnostics.

Conversion, Storage and Transportation

Before hydrogen can be used for power, it has to be converted, stored or transported. With pressures of up to 15,000 psi in the value chain, hydrogen must be effectively, efficiently and safely controlled. There can't be any inboard or outboard leaks due to integrity issues with static or dynamic seals. Even some metals can be negatively affected by prolonged exposure to H2, a process called hydrogen embrittlement. And there are also risk assessments and strict regulations to meet.

Working with hydrogen requires serious, dependable control to ensure systems operate safely. Companies need to know they don't have any loss across their systems, and they need to know how much hydrogen is passing through any transmission/transfer points. Integrating components that reliably monitor and measure hydrogen into systems is essential.

Every system includes certain final control elements (FCE), such as shut-off and metering valves, high-pressure regulators, pneumatic actuators and solenoid valves. Reliable, high-quality control and safety circuits provide the precision necessary to maintain appropriate pressure and flow rates and preserve hydrogen purity, and can be monitored remotely. Sensors should be integrated to monitor pressure, temperature and flow rates. If smart equipment is used, data can be collected to improve productivity and ensure high operational yields.

This is also where it's important to have a supplier with a complete portfolio. But what's even more important is working with partners with extensive hydrogen experience and expertise, familiar with the regulations and certifications. They understand the plantwide ecosystem and have the safety and controls equipment needed to monitor, measure and control hydrogen effectively and efficiently. They should also have the flexibility to address a vast range of designs and applications.

Mobility

A key element of the transition to hydrogen-powered vehicles is the fuel cell. Fuel cell power systems can be used to power passenger cars, commercial vehicles and more. Like electrolyzer manufacturers, fuel cell manufacturers can benefit from a strong, expert supplier with an extensive portfolio.

For fuel cells, that portfolio should include high-reliability flow control, pressure regulators, safety junction boxes and flameproof cable glands. Designs should be compact and lightweight to enable manufacturers to create systems with high-power density and extended cell life. Manufacturers can lower risk of fuel cell system failure with solutions that provide stable pressure regulation, safe distribution and equipment connectivity.

Example of ASCO™, Rosemount™ and TESCOM™ components from Emerson, used for measurement and control processes throughout the hydrogen fuel value chain.

Once hydrogen-powered vehicles populate the road, drivers will need to fuel them. As fueling stations transition to green hydrogen, they face several challenges, such as sustainability, safety and maintenance. First, there's the concern of accurately monitoring the hydrogen flow to ensure customers dispense the right amount of fuel, every time, quickly and safely. Accurately maintaining the condition of fueling stations and their critical components can ensure stations are available for users at any given time, whether they're deployed in dense or remote areas. Fueling station equipment can leverage digital transformation to solve some of these critical challenges.

Starting at the device level, smart senor technology and the data it provides can lay the foundation on which digital transformation is built. Building on this foundation, utilizing a programmable logic controller (PLC) with integrated edge gateway capabilities can provide complete control and turn aggregated data into real-time information/analytics of the fuel-dispensing process or the condition of the system itself.

The power of digital transformation can be scaled greatly beyond just one fueling station to a vast network of stations, where information can be aggregated to help optimize the entire network. Dispensing accurate fuel volumes at the highest flow rates safely, as well as reducing the probability of leaks and monitoring the condition of the fueling station, ensures robust operation and optimal yield.

The PLC, combined with an edge gateway, can also perform analysis and visualization of diagnostic and process data, which can be provided locally to the fuel station operator and remotely to the hydrogen supplier, simplifying supply chain logistics. Having remote access to filling rates and preventive maintenance information means hydrogen suppliers are filling tanks only when necessary and providing maintenance only when needed.

From storage tanks to tube trailers to dispensers, fueling station systems must also be safe and easy to maintain, as well as meet the highest performance and regulatory standards. And as we've seen throughout the value chain, hydrogen's explosive nature must be taken into consideration. To reliably protect personnel, customers and property, ultrasonic gas leak detection systems continuously monitor fueling stations for ultrasound generated from the release of pressurized gas. Pressure transmitters designed for high-pressure measurement and flow meters specifically designed for hydrogen-dispensing applications can accurately measure pressure and gas flow. Connecting these important devices that monitor critical parameters to a higher-layer gateway can be used to deliver real-time warnings and alerts to staff on premises or remotely, providing further safety enhancements.

The First Step to Sustainable Success

Building the infrastructure and processes needed to transition to green hydrogen requires a partner who can support companies at each stage of their scale-up. Taking a scalable approach will reduce risk while making meaningful progress.

Because green hydrogen is still a relatively new business, companies must rely on partners with broad knowledge and expertise that have already proven themselves in the hydrogen industry, from production and storage to conversion, transportation and mobility. These expert partners already know the regulations and certifications needed and how they change depending on region. And they likely already have a physical presence to manufacture close to customers and their markets.

Emerson, for instance, has been involved in the hydrogen industry since its beginnings. Since then, we've developed full capabilities across the hydrogen-fueling value chain around the globe. And we're very excited about providing innovative solutions for other new challenges as this expanding frontier presents them.

The Time Is Now

Green hydrogen is exceptionally clean and efficient, but as we've seen, building the infrastructure, controlling the gas and making it available for consumption requires expertise. Companies are better equipped to forge ahead if they partner with a specialist that already has a strong presence and relevant experience, holds deep industry and regulatory knowledge and can provide the needed solutions. This strategic partnership will give them a strong position and long-lasting competitive advantage as they make the promising future of green hydrogen a reality.

About the Author: Nicolas Marti is the business development manager EMEA — alternative fuel & combustion at Emerson. He joined Emerson in 2012 and specializes in hydrogen technology, including technologies for hydrogen filling stations and onboard H2/CNG applications. He received his education at the Paul Cézanne University Aix-Marseille III.

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