THE NEWEST INDUCTEES ARE READY FOR THEIR CLOSE UPS

2023 PROCESS AUTOMATION HALL OF FAME

THE NEWEST INDUCTEES ARE READY FOR THEIR CLOSE UPS

Translating automation techniques to managerial decisions

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Longevity matters, but what you do with it means more

SOME people will tell you longevity is the key to success. While it’s true that longevity is often a measure of a successful career, whether you’re an engineer, C-suite executive, actor or athlete, what you do over the course of that long career will be what ultimately sets you apart. So while Ichiro Suzuki may have played professional baseball for 28 years in two different countries, it’s his 3,089 hits and career .311 batting average in Major League Baseball alone (not including his stardom in Japan) that has him on the cusp of being enshrined in the Hall of Fame in Cooperstown, N.Y.

This month, I met three distinguished pioneers of control engineering as I put together our annual Process Automation Hall of Fame cover story. While all three can chalk up 30-plus years at the top of their field, let me tell you, it wasn’t just the years that had me wide-eyed with interest. Each one has a story that traverses many challenges and changes to process control over their careers. Each one tells how they not only overcame the evolution of the field, but embraced it as a new opportunity. Ultimately, they seized the chance to make a change themselves and left process control in a more advanced place than it was when they started.

One of the common themes they faced was the rise of computer processing in engineering. It may be hard to fathom these days, but there was a time when newfangled computers (often as large as rooms) offered new ways of designing control systems. It reminded me a lot of today’s digitalization, where data gathering and sharing has moved to the cloud, and many companies and engineers are still getting used to it.

Perhaps even more fascinating is that, although now retired, our three inductees—Tariq Samad, formerly of Honeywell; Carlos García, formerly of Shell; and W. Harmon Ray, formerly a professor of engineering at the University of Wisconsin—all found themselves working on new challenges early in their careers that engineers today still explore. One of those is artificial intelligence (AI). Another is sustainability. It’s a sober reminder that the work of engineers is a long journey that doesn’t usually have quick and simple answers. In that regard, success does require longevity, but longevity alone won’t solve the puzzles.

Like Ichiro’s 28 years in baseball, an engineering career is filled with singles and doubles, but home runs are fewer and farther between. But when you put enough work in and enough curveballs are put into play, the Hall of Fame awaits.

"While it's true that longevity is often a measure of a successful career, whether you're an engineer, C-suite executive, actor or athlete, what you do over the course of that long career will be what ultimately sets you apart."
Achieving manufacturing business value through the cloud

Companies typically go through three distinct waves of cloud-computing adoption

THROUGHOUT 2021, the world experienced a sharp rise in cloud-computing use, fueled by the global, COVID-19 pandemic. Never had such a force driven organizations away from on-premises (on-prem) file and application servers to access-anywhere infrastructures.

Despite this trend, consultant McKinsey & Co. revealed in its survey of global manufacturing companies on cloud adoption that, “74% of cloud-related transformations failed to capture expected savings or business value.” Respondents said cloud technology was more complex than originally estimated, and the skills needed to manage cloud transformation weren’t keeping pace.

A second conclusion was particularly telling: “One key driver of the dire state of many cloud programs is their sole focus on the value of IT (cost) optimization, rather than on potential business value. This issue turns up time and again in our data. Asked directly, most companies (about 59%) expect the cloud to deliver more value in the area of IT than in business.”

Even today, cloud transformation initiatives are in the domain of IT departments, where the primary purpose is replacing physical servers in a data center. This is driven by the goal to optimize the costs of storing data and maintaining core systems.

However, as a cloud transformation leader at a software company that serves the manufacturing industry, I see a more impactful target for organizational benefit, along with three distinct waves of cloud adoption that manufacturers typically ride.

Three waves of growth
The first wave of cloud technology implementation is focused on core IT workloads: storage, backup and disaster recovery, and data center size reduction. Most companies today have already achieved, or are at least close to reaching, these outcomes.

The second wave prioritizes the migration of business data and applications to the cloud. Typically, the catalyst is storing customer or financial data in cloud-based data warehouses, along with the ease of integrating with a growing base of employee-related, cloud-business applications. The migration to the cloud of mission-critical systems, such as enterprise resource planning (ERP) or laboratory information management system (LIMS), is a telltale sign a company is well into the second phase (Figure 1).

The third wave can be referred to as “generating business value through advanced cloud technologies.” During this stage, companies pilot or implement new types of software applications in the cloud—they’re no longer simply replacing or moving previously used on-prem systems. The marquee category here is artificial intelligence (AI), but other technologies such as digital twins, mixed reality, and the Industrial Internet of Things (IIoT) are also players in this space. In this phase, organizations must prove business value because the goal of these technologies is not IT cost optimization, but improved business efficiency and better outcomes.

Leveraging the cloud to drive business value
To advance beyond the first wave, manufacturers face unique challenges, particularly at the operations level. Most industrial companies have invested in legacy operational technology (OT) systems over the decades, which are designed to run critical, factory, real-time process control systems. These systems have grown in complexity, and are deeply embedded in operations. Though they lack the scalability and advanced computing capabilities of the cloud, they’re not easily replicated or replaced, and it can be challenging to integrate them with cloud-based tools.

OT technology also demands a specialized skillset from plant personnel. OT system administrators must not only know the specific technology deeply, but also understand how the entire plant runs. Also, these experts are tasked with keeping OT data safe and compliant with standards like ISO, SOX and GDPR, though most aren’t trained in cloud-based services. This exac-
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Marathon Oil generates smart maintenance flags

An independent U.S. energy producer, Marathon Oil (www.marathonoil.com) recently faced a monitoring challenge with thousands of assets spread across geographically diverse locations nationwide. In 2022, it embarked on a cloud-migration journey to automate intelligent maintenance alerts, and notify operational teams when any asset was operating under its expected production capacity. This would trigger a root cause investigation or maintenance request.

Early in the company’s cloud migration efforts, it took months to synthesize relevant data, and generate useful alerts and insights without excessive false positives. But, as time went on and Marathon refined its software algorithms, intelligent alerts became second nature. Today, the company monitors more than 4,000 assets, requiring only a few hours to identify and verify operational anomalies, and notify plant personnel.

Migrating to the cloud

Following in Marathon’s footsteps, companies are generating business value using the cloud by embracing some key best practices. Marathon mentions the first imperative: nurturing a culture of innovation, propelled by the idea that if business practices and technologies don’t evolve, companies can’t keep up with new market trends and demands.

The second practice is strategizing. In addition to research up front, cloud strategies should follow a trajectory of pilot, proof-of-concept, and scaling to meet IT and broader business outcomes. Outcomes should drive cloud investments, not vice versa.

Third, companies must invest in employee training and skills development. In the age of Industry 4.0, organization-wide digital abilities are required to keep the workforce aligned with business delivery and operational objectives.

And finally, manufacturers must find ways to integrate OT functions with cloud infrastructure. This marriage ensures continuity of critical processes, while producing new operational and maintenance insights, increasing efficiency, boosting profits, and generating overall business value.

It doesn’t start with a cloud strategy, but a business strategy. And, as an organization executes its plan, appropriate cloud technologies are deployed to support desired outcomes. ∞

Megan Buntain is the VP of cloud transformation at Seeq. She leads its transition to cloud-native solutions to support global customers. She has more than 25 years of experience in the software industry. Prior to joining Seeq, Buntain served as a sales and marketing executive at Microsoft and was CEO of a consulting firm that advised SaaS companies on cloud go-to-market strategy.
The evolution of non-contacting radar in chemicals, oil & gas and utilities

**WHILE** There are different level measurement technologies in place, non-contacting radar has shown to be effective for a multitude of applications, and the technology has evolved considerably over the last 50 years. Ilya Rikhter, general manager of Rosemount Process Level at Emerson, the inventors of radar level measurement technology, recently talked with Control about the benefits and evolution of non-contacting radars.

**Q:** Why non-contacting radar versus other technologies for level measurement?

**A:** There are many different level measurement technologies available, and the reason for this is the variety of applications. There are less complex applications, such as IBC (intermediate bulk container) tanks, open channel flow and some simple storage tanks. There are more complex vessels such as boilers, distillation columns and reactors. There’s no universal type of technology that can cover all applications at once. There are different varieties of technologies in place and non-contacting radar technology is one of them.

The technology has strong benefits because, as its name suggests, it’s non-contacting. It does not come into direct contact with the product being measured. As this is an electronics-based technology, it allows for good scalability, as well as for additional functionality such as diagnostics, a variety of output protocols, and many other things that help customers worldwide be more efficient with their level measurement applications.

**Q:** Can you expand on the benefits and some of the industries that would benefit?

**A:** There are many considerations that could be put into use when choosing one technology versus another. Non-contacting radar has a specific purpose of measuring the top product level surface and the technology is beneficial in cases where there’s lots of turbulence on the surface. These are applications where we don’t want the radar device in direct contact with the process media, perhaps because the process is highly corrosive, caustic or the media is viscous and sticky.

Another consideration for non-contacting radar is specific tank geometry, such as extremely tall tanks or tanks with some internal obstruction in place. Generally, non-contacting radar is a very versatile technology and easy to deploy because it’s generally fit and forget, so commissioning goes smoothly in most cases.

**Q:** Non/contacting radar technology has adapted to meet various industry needs?

**A:** I think the technology maturity curve shows that many devices have good accuracy and are capable devices when it comes to handling long measuring ranges. Also, the majority of these devices can handle extreme process pressures and temperatures, and they have good grounds to be compliant with functional safety standards.

Specifically, where the technology has evolved is around general reliability of measurement, also coupled with the high sensitivity of measurement. In the old days, you could get just one or another. You could track the product surface fast enough, but the measurement wouldn’t be super reliable. Or vice versa, measurement would be super reliable, but the technology would only be a good fit for slow-moving processes.

Two other domains where contemporary non-contacting radar devices have made major advancements are connectivity and ease-of-use. If we take the measurement reliability and sensitivity part first, the technology has evolved to the point where you can achieve both at once. You can have reliable measurement, and you can couple it with extremely fast-moving processes. This is what we call Emerson’s Fast Sweep Technology. And, in the case of Emerson, 50 years of product innovation and evolution have led to our latest release of two new radar level transmitters utilizing Fast Sweep Technology—our sixth-generation non-contacting radar transmitters. So, we have 50 years on our backs to have some judgment about the quality of measurement, and how to package it in a form factor that’s beneficial to our customers’ applications.

Then, the second domain is connectivity options. Different industries require different protocols. We know that 4-20 mA HART is still the de facto standard, but there are many other emerging protocols, such as IO-Link Bluetooth® and Ethernet-APL, that we’re actively considering when working on our new programs. And, of course diagnostics, the amount of data about the device and the process itself, you can get from this very specific radar installation.

**Q:** What are some of the values of the products for various industries?

**A:** We’ve released a couple of new products, but let’s start by grounding ourselves around the Rosemount 3408 Level Transmitter because it’s the non-contacting radar that’s been around for the past six years. It’s had great success, specifically in the oil and gas, refining and petrochemical industries. This is the device that generally covers the widest range of applications. It’s robust. It has a lot of diagnostic capability, and it’s a very good fit for pretty complex applications.

The need our customers have been communicating to us is that it would be really good to be able to package similar processing power, measurement robustness and diagnostics capabilities into something that would fit other types of applications. This is basically the reason for us to have worked on two new, non-contacting radars. The first is the Rosemount 3408 Level Transmitter. This is the device that’s optimized for the chemical industry, incorporating smart features that reduce complexity throughout the product’s lifecycle for ease-of-use. For ease of commissioning with an intuitive graphical user interface and Bluetooth® enabled functionality, we incorporated Emerson’s proprietary Smart Meter Verification software. This provides an easy means of verifying device health with no process interruption, and a modular design with easily interchangeable electronics for streamlined maintenance and upgrade.

The second new product, the Rosemount 1208 Level Transmitter, completes the non-contacting radar level portfolio. This transmitter has been specifically designed for simple applications where customers anticipate needing 100% plug-and-play. Both of these new devices utilize unique 802.11 wireless technology—a culmination of Emerson’s 50 years of radar level technology innovation, resulting in our most robust and reliable process level measurement available today.

So, the Rosemount 5408, 3408 and 1208 non-contacting radars have been developed, while having in mind our customers’ needs and challenges in the different industries. From the most demanding applications in the oil and gas or chemical industries to the simplest ones in process industry utilities or water and wastewater, there’s a Rosemount non-contacting radar level transmitter suited to solve your needs.
Serve the vision or the victim?

Consider the end-user’s pain when deploying future projects

BRILLIANT visions of digitally integrated processes have inspired us since the first “smart” transmitter (containing a microprocessor) became widely available. Initially, this chip-ware was primarily an aid for configuration—setting ranges and analog outputs, as well as containing a characterization of the sensor to improve the rangeability/turndown and accuracy of a given device. But visionaries were already imagining a day when the “intelligence” of field devices would be used for much more.

More than three decades later, your next project will most likely deploy 4-20 mA transmitters connected to a centralized DCS or logic solver. Relatively easy interconnection of household appliances like refrigerators, thermostats, lamps, and media servers (television, anyone?) might lead your management to think digital integration is easy. How is it we’re still mucking around in the sloppy, analog valley of despair?

It’s been about 10 years, but I remember sitting in (retired IC&E manager) Sandy Vasser’s talk on ExxonMobil’s vision for automation, and being dismayed at his assessment of the control professional’s role in Exxon projects. “Process owns the measurements,” he said. “We’re providing infrastructure.” While Sandy was doubtless at a pay-grade to which I might only aspire, I was disturbed by this mundane representation of control’s contribution to the enterprise. Were we merely erectors of (electronic) structural steel or pipe supports? I was also aware of another snippet of ExxonMobil’s view of available digital integration, a perspective I also aspired to rebut.

Sandy is famous for his seminal thinking around flexible remote I/O, branded “electronic marshalling” by Emerson, and now offered in some form by many control system suppliers. Marshalling, if you’re new to the discipline, is how we describe terminating multi-pair cables in a control house, from which “scatter wire” (individual pairs) runs to various points on disparate I/O cards. Flexible remote I/O was a key component of the “DICED” strategy (auto-detect, interrogate, configure, enable, document I/O), which allows control engineers to fashion a system by selecting standard, prefabricated components from a catalog. Field devices automatically reveal their role and identify once connected to the I/O, and so on. All this speeds delivery of controls infrastructure to the project, and keeps the I&C team off the critical path. The flexible I/O permits one to address late additions and changes that are the bane of project managers.

It’s interesting that the problems solved by flexible and distributed I/O were also (already) a feature of Foundation Fieldbus and Profinet PA protocols. After ExxonMobil was prompting suppliers to develop and advance electronic marshalling, Larry O’Brien, now vice president of research for ARC Advisory Group, coined the term “virtual marshalling.” Smart devices on a two-wire bus didn’t need any “marshalling,” and accommodated late additions just as easily.

While at school even more decades ago, I interviewed with ExxonMobil. The recruiter told me the company liked new engineers to spend a few years in the plant before aspiring to any corporate role. There was wisdom in that philosophy that escaped me in my 20s. Engineers, who’ve been immersed with their end-users as the “victims” of their projects, are much more likely to consider their pain when deploying future projects. It’s a lesson I’d have to keep learning. ExxonMobil engineers didn’t see themselves ripping out their favorite DCS (which didn’t support Fieldbus), and whose then-current support for fieldbus was a late offering. In-plant experience had taught them, and no one wanted to own what was likely to be a struggle for the plant.

Hopefully, few of us need to revisit the notion that the shiniest, newest tech gadgetry should be undertaken warily, incrementally, and preferably with considerable end-user engagement. We can aspire for the same thing as Sandy—to be invisible. Like a good movie soundtrack, we know our controls infrastructure is a success if no one notices it! ☠
Environmental monitoring: a wireless ‘sweet spot’

Understand the impact of your activities and how they affect long-term operations

**UNDERSTANDING** the environment around you is important not only to protect workers, but also to understand the potential impact your activities have on your surroundings. Those activities can impact the long-term sustainability of your operations.

These measurements tend to be widely distributed in and around the perimeter of a facility or temporary, such as during maintenance activities or work outages/turnarounds. This makes collecting this information well-suited to wireless data collection systems. Many environmental monitoring systems also tend to send aggregated data as a burst of information periodically, rather than continuously, as is done for real-time control systems. That removes the criticality of timing because, if the transmission fails, it can be sent again a few minutes later without any impact to the overall logging functionality of the system.

Real-time reporting is less rigorous in typical data aggregation. For example, emissions monitoring stations located remotely from the facility capture ground-level readings from stacks. Because these are analytical measurements, they tend to only update periodically when the analytical cycle itself is complete.

Typical data gathering applications also include water stream monitoring for flow and analytical properties, including turbidity and/or status of equipment such as auto-samplers. In addition, wildlife monitoring for migration paths, foraging patterns or nesting conditions use periodic updates because they rely on collars, which are a form of edge device, to collect data and transmit at predetermined intervals.

The more common, automation-type connection with real-time notification will be associated with a temporary installation that has worker safety implications such as:

- Enclosed space entry for detection of hazardous gases;
- Maintain communications between workers, monitor for person-down situations, and automatically notify remote safety team to protect the individual in distress and their coworkers;
- Facility outage or turnaround perimeter monitoring for ingress, or the more likely scenario of releasing some substance that needs to be monitored or reported due to opening vessels and related operations;
- Drilling rigs where there’s risk of releasing hazardous gases, such as hydrogen sulphide, or the less insidious replacement of oxygen with some other gas with the same potential for injury or loss of life; and
- Spill cleanup to monitor the environment during the event for possible leaks or emissions to protect workers, and following the event to ensure cleanup efforts were successful.

Wireless is well-suited for the above applications and many similar situations, which I’m sure readers are familiar with or can quickly identify.

One of the challenges with any temporary installation will be setup and provisioning of the network within the constraints, physical bandwidth demands and cybersecurity considerations. It also includes the restoration and closure of any connections when the installation is dismantled.

Items to be considered during provisioning include:

- Assignment to a network that can include the necessary subnet and determine which ISM band is being used (typically 2.4 or 5.8 GHz) to avoid conflict with other users; and
- Public/private key authentication for joining the network.

At the end of the project, you shouldn’t forget to “sanitize” the devices to factory settings to prevent accidental loss of intellectual property (IP) or compromise cybersecurity.

Most projects focus on the measurements themselves and overlook the necessary infrastructure, but rarely do it more than once. This is because doing so results in difficult problems or delays, plus the expense of installing necessary equipment to complete required connectivity. These situations are more expensive and embarrassing with wired infrastructure. ☞
Endress+Hauser celebrates 70th birthday

Present performance enables building for the future and sustainability

AFTER seven decades in business, Endress+Hauser (endress.com) is off to a good start. At its annual media conference on April 4, the measurement and automation company reported strong worldwide growth in 2022, which well-positions it to embark on its next 70 years.

To prepare for its 70th anniversary in 2023, Endress+Hauser reports it delivered more sensors than ever last year, and shipped more than 2.9 million instruments worldwide, despite strained procurement and logistics chains. It adds that incoming orders grew 8% faster than sales, though profits before taxes decreased 12% due to increased operating expenses, costly currency hedging and investment losses. Meanwhile, Russia’s invasion of Ukraine clouded the company’s outlook early in 2022. It was also impacted by threatened energy shortages in Europe, high inflation and rising interest rates in many countries, and persistent COVID-19 lockdowns in China.

“Rarely has our business environment been characterized by so many challenges as in 2022,” stated Matthias Altendorf, CEO of Endress+Hauser, during the media event in Basel, Switzerland. “Our business nevertheless developed stably throughout the year.” Specifically, the company’s net sales increased 16.4% to 3.351 billion euros in 2022. This included organic growth of 11.6%, excluding currency effects, according to Luc Schultheiss, CFO at Endress+Hauser. All geographic regions and industrial divisions contributed to this growth, including process instrumentation and Innovative Sensor Technology (IST).

Infrastructure for innovation

Endress+Hauser also reports it spent 240.5 million euros in new buildings and machinery last year, which was a 24.7% increase compared to 2021. This brought its infrastructure investment over the past five years to more than 1 billion euros. Projects worth around 500 million euros are presently being implemented, including the four largest in Maulburg, Germany, Suzhou, China, Jena, Germany, and Greenwood, Indiana.

“These investments lay the groundwork for future growth,” says Altendorf. “Product innovations drive our growth.”

Endress+Hauser reports it spent 242.4 million euros on research and development in 2022, which was roughly 7.2% of sales, and 13.6% more than the previous year. The company applied for 235 patents for the first time at patent offices worldwide, and introduced 43 new products in 2022.

On the sustainability front, Endress+Hauser scored 76 out of 100 points, again occupied a leading position in the 2022 Eco-Vadis sustainability benchmark, and placed in the top percentile of the comparison group. The company calculated its carbon footprint along the value chain as the basis for the development of a climate strategy. It also recently joined the Science Based Targets initiative with the goal of reducing emissions to net-zero by 2050.

Finally, to mark its birthday, the company is inviting more than 1,000 customers, partners and experts to Basel to discuss the sustainable transformation of the process industry. “For 70 years, we’ve done everything we can to ensure a good future,” adds Altendorf. “And we’ll continue to do so.”

Four keynotes to highlight CSIA conference

Four keynote speakers will anchor educational programming at the 2023 Control System Integrators Association’s (CSIA), www.controlsys.org/conference2023) executive conference on May 15-19, in New Orleans. Unique perspectives and a wealth of experience will be delivered by:

- **Researcher and analyst Alex Chausovsky, who will present, “Economic and labor market update,” with practical and actionable advice to help business leaders plan for future economic conditions and elevate their organization’s talent strategy.**
- **Former U.S. Navy Seal and leadership instructor J.P. Dinnell, who will present “Extreme ownership for business and life, about the winning mindset and culture of “task unit bruiser.”**
- **Entrepreneur Mike Maddock, who will present “The questions disruptors ask themselves,” which focuses on the unexpected, replicable and generative questions enlightened leaders learn to ask themselves and their teams.**
- **Author Lisa Ryan, who will present “Integrating engagement strategies: how to keep top talent from becoming someone else’s,” about the issues system integrators face in attracting and retaining top talent in a post-pandemic workplace. Attendees will be advised on actions they can use immediately.**
SCADA/HMI market to reach $11.3 billion by 2033

Users facing market pressures and seeking to digitalize will increase investment in supervisory control and data acquisition/human machine interface (HMI) software by a 6.2% compound annual growth rate (CAGR) from $6.17 billion in 2023 to $11.3 billion in 2033, according to the recent “Industrial Automation Software” study by ABI Research (www.abiresearch.com).

The research firm adds the SCADA/HMI software market “isn’t incredibly expansive, with prominent vendors holding significant market share. While there are pure-play software vendors, they have less market impact than those in the MES market.” It adds the most significant market shares are held by Emerson, Siemens, and Mitsubishi Electric, with 17.3%, 12.1%, and 11.6%, respectively.

ABI adds modularity and integration are the two main design elements championed by SCADA/HMI suppliers. Similarly, HMI/SCADA software is designed with open standards that allow easy operability with each users’ production processes.

ABB investing $170 million in U.S. sites

ABB (www.abb.com) reports it’s accelerating growth in the U.S. by investing about $170 million to build facilities and create skilled jobs. For example, it poured the foundations Apr. 5 for its greenfield drives and services facility in New Berlin, Wis. The nearly $100 million project is expected to finish in late 2024.

Other U.S. projects underway include investing $3 million in an Installation Products Research & Development Lab and Innovation Center in Memphis, Tenn., and opening a $2 million packaging and logistics facility this year in Atlanta, Ga.

Four other previously announced projects include: $40 million investment in a new facility in Albuquerque, N.M., to manufacture Elastimold underground cable accessories; $20 million expansion of North American robotics facility in Auburn Hills, Mich.; opening a $4 million Installation Products Division Northeast Distribution Center this year in Lehigh Valley, Pa.; and opening an electric vehicle charger manufacturing facility in Columbia, S.C., to build up to 10,000 chargers per year. ☪
SIGNALS AND INDICATORS

- Honeywell (www.honeywell.com) announced Mar. 22 that lithium-ion battery (LIB) manufacturer Kore Power (korepower.com) will deploy Honeywell’s end-to-end, integrated, digitalized Battery Manufacturing Excellence Platform (MXP) at the KorePlex gigafactory in Arizona. With continuous closed-loop control, MXP will enable Kore to visualize and control its entire LIB production process in real-time.
- Digi-Key Electronics (www.digikey.com) celebrated its 50th year in business on April 3. In honor of the milestone, Thief River Falls Mayor Brian Holmer, mayor of Thief River Falls, Minn., proclaimed it “Digi-Key Day in the City of Thief River Falls.” The distributor and digital solutions provider’s team members recognized and commemorated the event during a week-long celebration and at other company events throughout the year.
- FDT Group (www.fdtgroup.org) released its FDT UE developer evaluation software on Apr. 6. This tool expedites the ability to build FDT3-based system and device type manager (DTM) solutions to meet users’ demands for modern, intelligent device management and monitoring required by IoT architectures.
- Motion Industries Inc. (www.motion.com) unveiled Apr. 5 its latest, 33,000-sq-ft Motion AI (www.ai.motion.com) facility in Beverly, Mass., which complements its existing locations in Danvers and Woburn, Mass. MA. Motion distributes replacement parts and industrial technology solutions, while Motion AI provides industrial automation solutions and turnkey engineered control systems.
- Mott Corp. (www.mottcorp.com) reported Mar. 30 that it’s acquired Digested Organics (digestedorganics.com), a Michigan-based engineering company that specializes in water reclamation solutions for waste streams, and manufactures advanced filtration solutions to reduce wastewater disposal costs, reclaim clean water for reuse, and produce valuable co-products.
- Bentley Systems Inc. (www.bentley.com) announced Mar. 22 that Worldsensing (www.worldsensing.com) is acquiring its sensemetrics’ Thread connectivity device business, while Bentley will be the lead investor in Worldsensing’s Series D fundraising effort.
How to make intrinsic safety inherent

Control's monthly resources guide

PUTTING SAFETY IN CONTEXT

PEPPERL+FUCHS
www.pepperl-fuchs.com

STANDARDS, CODES, REGIONS
This 52-minute webinar video, “Introduction to intrinsic safety” by Dave Malohn, staff engineer in the Energy and Power Technologies division at UL, teaches the definition of IS, different types of IS equipment, applicable standards and codes, differences between North American and international IS requirements, and fundamentals of designing IS equipment. It’s at www.ul.com/resources/introduction-intrinsic-safety

UL SOLUTIONS
www.ul.com

MORE SAFETY UNDERSTANDING
This online article, “Understanding what is meant by intrinsically safe,” defines hazardous areas, shows how to select pressure transducers and load cells for IS areas, describes installation and risk management, and answers frequently asked questions. It’s at www omega.com/en-us/resources/understanding-what-is-meant-by-intrinsically-safe

OMEGA ENGINEERING
www.omega.com

THREE PARTS—AND THE ENTITY
This seven-minute video, “Intrinsic safety: protection technique for hazardous locations” by Hazcon Inc., covers basic principles, the three components of an IS system, circuit installation, and how the components work together to become an IS system, also known as the entity concept. It’s at www.youtube.com/watch?v=Eh4sTx9DqK8

THORNE & DERRICK INTERNATIONAL
www.heatingandprocess.com

ISOLATORS AND BARRIERS
The online repository, “Intrinsic safety, barriers and isolators,” provides links to IS articles about fundamentals, IS design, difference between IS and explosion proof, IS in hydrogen/oxygen mixtures, calculating IS loop approvals, subdivision of gases, cable parameters, IS junction boxes, minimum ignitions curves, Zener diode barriers and others. They’re at https://iceweb.eit.edu.au/equipment/intrinsic_safety_barriers_and_isolators.html

ENGINEERING INSTITUTE OF TECHNOLOGY
https://iceweb.eit.edu.au

VERIFICATION, PLAN AND LAYOUT
These two short videos, “Intrinsic safety verification made easy” and “How to layout an IS circuit” by Barbara Vazquez-Isla, automation sales engineer at R. Stahl, show how to verify Ex I IS for hazardous applications with equipment from different manufacturers, as well as plan for IS circuits and layout IS cabinets. They’re at www.youtube.com/watch?v=SqG2Z6xT3OM and at www.youtube.com/watch?v=ByLdVzh5Phs

R. STAHL
https://r-stahl.com

DESIGN, INSTALL, INSPECT
This 20-page document, “A user’s guide to intrinsic safety” from MTL Instruments, Cooper Crouse-Hinds and Eaton, introduces its basic concepts and nomenclature, installation and inspection methods, system designs, and maintenance and repair procedures, including a section on dust. It’s at www.mtl-inst.com/images/uploads/datasheets/App Notes/AN9003.pdf

MTL INSTRUMENTS
www.mtl-inst.com

PRACTICAL PRINCIPLES
This five-minute video, “Principle of Intrinsic Safety—Explanation of Intrinsic Safety Technology,” covers dangerous gas mixtures, ignition curves, and how to limit them with Zener diodes and limiting circuits. It’s at https://www.youtube.com/watch?v=7WkKw28QJZE

PHOENIX CONTACT
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EVOLUTION OF FISCO
This online article in Chemical Processing magazine, “The intrinsically safe fieldbus has arrived” by Dave Rizzo, explains the evolution of intrinsically safe concept (FISCO), how it works with device couplers and power supplies, the split-architecture solution, entity parameters, and reducing downtime while easing maintenance. It’s at www.chemicalprocessing.com/automation/automation-it/article/11375624/the-intrinsically-safe-fieldbus-has-arrived

CHEMICAL PROCESSING
www.chemicalprocessing.com

( NO) BLAST FROM THE PAST
This online article, “Sure-fire intrinsic safety,” is the Resources Guide from 2017, and it consists of nine entries on understanding and implementing IS principles. It’s at https://www.controlglobal.com/protect/intrinsic-safety/article/11309748/resource-guide-sure-fire-intrinsic-safety

CONTROL
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Is your hot backup hot enough?

Hot server backup plays an important role in mission critical systems. Meanwhile, the bar for resilience continues to get higher for small and large systems. That leaves many in the field to wonder: are traditional models of server failover good enough?

To find out what most automation experts think about hot backup and what can be done to ensure proper backup, we talked with Chris Little, who represents VTScada by Trihedral. As a member of Trihedral’s marketing team for more than 15 years, he’s been able to wear a variety of hats. In addition to performing live software demonstrations at industrial automation conferences across North America, Little is a co-host and co-producer of the Automation Village, a monthly streaming show for industrial automation lovers. He also produces articles, case studies, and videos covering a variety of topics related to industrial monitoring and control.

Q: What do most automation experts define as “hot backup”?

A: In simplest terms, it means that when a primary server fails, another takes its place without human intervention. Hopefully, the software supports more than just one backup, and hopefully at least one of them isn’t in the same location as the other.

Q: What is the problem with how this is usually done?

A: Well, one problem is that, for many software products, there’s a hard limit on how many backup machines you can configure. For some common platforms, the limit is two. That’s a problem, since an incident serious enough to take out a server can easily take out two. Even if these computers aren’t in the same building, events like floods, hurricanes or earthquakes can damage multiple facilities.

But, another potentially serious consideration is the way that many products handle historical data. If the system is configured so each backup machine logs its own data, then each one will have a different view of the historical data. No two will have the same timestamps in their histories.

Not only does this overlap I/O devices and communication networks, but it can make trending and reporting inconsistent across multiple computers.

Worse, trying to correct for this problem can involve complicated coding of system-intensive batch files to copy datasets from one machine to another or a timed basis.

Q: How do you turn up the heat on your backup?

A: Rather than every server trying to pull all their own I/O from the PLCs or RTUs, only the designated primary server should do the pulling. The backup machines should simply synchronize with that primary. What this does is create a coherent data set across all machines. Every piece of time-stamped data is identical regardless of what workstation you use. This is the approach used by VTScada software. Its integrated historian was designed for distributed systems, so it can synchronize efficiently across the network.

Q: But what if the network goes down and these distributed backups can’t sync with the primary?

A: In that case, each computer becomes the primary server for its local I/O and logs independently. Operators at each location can continue monitoring and controlling their local assets, and see local history. When the network is restored, VTScada uses bidirectional synchronization to share time-stamped data from each isolated computer with every other machine. Again, the result is one coherent dataset across the whole distributed application.

Q: When your system can’t fail, will one backup cut it? Will two?

A: That’s another important consideration when it comes to long-term system resilience. Traditionally, failover and synchronization require some form of script coding. While this can provide a high degree of control, it also introduces complexity and risk. This can be a serious problem down the road if the system requires expansion or troubleshooting, and the person who coded it has retired or won the lottery. The more custom code an application includes, the more due diligence is required each time the software is upgraded to the latest version. For this reason, many applications are frozen at a specific version, and are unable to take advantage of the latest features and security updates.

Q: How difficult is it to code versus the traditional approach?

A: When specifying new and updated systems, redundancy often shows up as a single checklist. It’s included or it isn’t, but as we discussed earlier, what “it” is can be a lot of things. It could mean a system with few levels of redundancy, high overhead and poor resilience over time. Be sure to ask questions. How many redundant servers will this include? Where will they be located? Do we need a third-party historian product that requires its own licensing, support and failover strategy? How is historical data synchronized and protected? What is the expected lifecycle of this application? Will my servers need to be isolated and frozen at a specific version? What is the upgrade strategy? Who will be able to maintain it 15 years from now? The answers to these questions will tell you a lot about how “hot” your hot backup will be.

‘Hopefully, the software supports more than just one backup, and hopefully, at least one of them isn’t in the same location as the others.'
IF there’s a common theme among this year’s inductees into Control’s Process Automation Hall of Fame, it’s that they’ve witnessed and been integral in the evolution of the use of computer power in process control. As this data processing technology grew, new ideas were more easily explored. Each says the rise of computer power aided their work immensely and their ability to advance their unique ideas.

This year’s class of inductees represent two of the biggest corporations in the world and one of the most recognizable university engineering departments in the U.S. They’re all leaders in the evolution of industrial control processes.

Over the last several weeks, they talked with Control about their careers, their accomplishments, and their thoughts on automation and process control. On the following pages, we tell their stories of their pasts and catch up with their presents.

Please join us in congratulating the newest members for the Hall of Fame. Tariq Samad is senior fellow and Honeywell/W.R. Sweatt chair at the Technological Leadership Institute at the University of Minnesota. He’s retired from a long career at Honeywell. W. Harmon Ray is a chemical engineer, control theorist and applied mathematician, who served as a Vilas Research professor at the University of Wisconsin-Madison. Carlos Enrique Garcia culminated a 36-year career as global discipline head for process control at Shell (retired).

We hope you enjoy getting to know these fabulous engineers and learning about their career journeys.
A winding road

As an undergraduate at Yale, control wasn’t in Tariq Samad’s plans. Sure, he took a few control courses, but he had his eye on other engineering disciplines. We’d like to tell you that all changed when he got to grad school, but, “I actually didn’t take a single control course in graduate school,” he says. In fact, his Ph.D. thesis at Carnegie Mellon University (CMU) was on artificial intelligence and computer-aided design. So, sitting down for an interview in 2023 and talking to an editor of Control magazine for his induction into the Process Automation Hall of Fame would’ve been difficult to comprehend for his younger self. However, through a number of twists and turns in his decades-long career, Samad became one of the recognizable faces in the field.

Samad eventually found his way into control during the early stages of a 30-year career with Honeywell. He also served terms as president of the American Automatic Control Council and the IEEE Control Systems Society. Since then, he’s retired from corporate life, and now teaches at the University of Minnesota.

Samad joined the Honeywell Computer Sciences Center after graduating from CMU. “Honeywell was a major manufacturer of computers, and this center was dedicated to the computer business,” Samad says. “Six months after I joined, Honeywell announced it was getting out of the computer business.”

His boss at the time told him, “You had offers from some other places before you came here and we aren’t going to be doing computers anymore, so you should see if you can refresh those offers.”

That was the first twist of fate in his career, but many others would soon follow.

Samad got into neural networks, which at the time were at the peak of one of several hype cycles the discipline has gone through. He says it didn’t take long for him to realize that emerging AI technologies had a connection with control—in which domain, of course, Honeywell was a major player. “I was working with people who knew a lot more about control science and engineering than I did,” he recalls.

He was also beginning to recognize there were many issues that the AI community was trying to address in ad hoc, anecdotal ways.

“The attitude was often, ‘Let’s try this heuristic and see if it works,’” he describes. “But control, as I learned to appreciate, was all about rigor and systematically thinking things through. It was having a mindset that imparted confidence in what you were doing, rather than trial and error. So I decided I was in the right place to learn more about control and explore its connections with AI.”

For a long time after, he worked on applying neural networks and other technologies, such as genetic algorithms and fuzzy logic and evolutionary computing, to control systems.

Samad describes his Honeywell career as two equal parts, about 15 years each. The first half involved participating in and leading research and development projects. Then, halfway through his tenure, he became a corporate fellow at Honeywell, the highest level on the technology ladder. “From that point on,
my work became more about technology leadership rather than individual projects,” he says. “I was involved in spearheading new initiatives that connected technology and business as well as leading the fellows community companywide.”

Samad adds that being at Honeywell immersed him in many different application areas. He worked in aerospace, process automation, manufacturing, homes and buildings, automotive, power systems and smart grids. Some of his work was internally funded. Other work was funded by external agencies, such as the Defense Advanced Research Projects Agency (DARPA) and the Electric Power Research Institute (EPRI).

With DARPA, he led a project to develop control systems for the first flight of a fleet of coordinated unmanned aerial vehicles (UAV) in an urban environment. “It was a deserted military base with multiple, heterogeneous UAVs flying coordinated routes for surveilling the whole space,” he recalls. “We were bringing model predictive control (MPC) ideas into these different fields where there wasn’t as much appreciation for control.”

Samad also recalls several interesting projects in the second half of his career at Honeywell. He led an initiative on carbon capture, usage and sequestration (CCUS) before it became the growing endeavor it’s become these days. “This was over a decade ago, and we undertook a deep dive into the technology and market opportunities for CCUS,” Samad says. “Many more companies, including Honeywell, are now active in this area.”

Samad also led a sensing and control workstream in the Obama Administration’s advanced manufacturing partnership program. There, he worked with a team of national experts to identify outstanding challenges and priorities related to sensing and control. The goal was to elevate manufacturing in U.S. Smart grids, which was another hot topic at the time. Samad was elected to the governing board of the Smart Grid Interoperability Panel, convened by the U.S. government, where he served as the industry representative for the residential, commercial and industrial customer base.

He retired from Honeywell seven years ago, and decided to join the University of Minnesota, where he holds a Honeywell-endowed chair in technology management. He describes the Technological Leadership Institute (TLI) at the university as a think tank and professional education organization. Samad is the director of graduate studies at TLI, which has programs in technology management, medical devices, security technologies and electrification.

Exploring a new field
Since you’re reading this, there’s a chance you crossed paths with W. Harmon Ray. If you studied at the University of Wisconsin-Madison, you may even have been taught by him. In fact, some Process Automation Hall of Fame members at the university were Ray’s colleagues.

He’s a chemical engineer, control theorist and applied mathematician, who served as a Vilas Research professor at the university. In 2000, he won the prestigious Richard E. Bellman Control Heritage Award for distinguished career contributions to the theory of application of automatic control, and in 2019, he won the Neal Amundson Award for excellence in chemical reaction engineering.

Now retired and enjoying life with his wife, Nell, Ray reflects on a long and distinguished academic career. He says he was lucky to parallel the evolution of computer systems in engineering. In fact, it was the chance to work with those new computers that got him into the field in the first place, when he went to college at Rice University in Houston in the late 1950s.

“I was lucky to begin my chemical engineering studies just as computers were starting to being used,” he recalls. “My undergraduate study was at Rice University, which built its own computer. I learned to program it, giving me computer skills, and I also was introduced to mathematical modeling.”

Ray continued to hone his computer modeling skills after graduation. He headed to the University of Minnesota, where Neal Amundson and Rutherford Aris were at the forefront of applying mathematics and computers to engineering problems. Given his piqued interest in both, he knew there was no better place to do his post-graduate work. “My work with Aris combined computer skills with modeling and control of chemical reactors,” he says.
He explains his interest in computer modeling stemmed from his interest in exploring new things. “It was a blank slate. If you had a new idea, you could explore it,” he says. “You had the whole field to explore.”

With a bit of a chuckle, Ray adds he kept his trusty slide rule with him. “Computers were homemade. They were quite large at that point.” Mobil computing was still decades and a few brash Silicon Valley entrepreneurs away from reality.

His post-graduate experience opened several options for the young engineer. However, he was hooked on the possibilities of computer computations in engineering applications, so he opted for academia rather than industry. “I decided to look for an academic position, rather than an industrial position, so I could have the freedom to choose which areas of research to pursue,” he recalls. “When I graduated from Minnesota, the University of Waterloo in Canada had the most up-to-date computer facilities in North America. Later, I moved to the State University of New York (SUNY) at Buffalo and then to the University of Wisconsin.”

Ray quickly began to make a name for himself as a researcher, particularly in modeling chemical processes. “Computers opened whole new areas of engineering. By modeling chemical processes, once you understood them, you could learn what was needed to control the process to get the desired outcome,” he explains. “This required software development to use data about mechanisms, kinetics, properties, operating conditions, potential problems to produce desired products, and do so efficiently and safely.

“The modeling and control of polymerization processes led to the field of polymer reaction engineering and the development of our Polyred computer program. For any polymer or reactor, we could predict results under given operating conditions and, by varying various parameters, obtain the optimal operating policy. We could test the accuracy of the program in our own polymer lab.”

As industry became aware of the power of computers to improve products and methods, Ray did a lot of consulting in
addition to his research and teaching. “I believe that such interactions between academia and industry are vital and beneficial to both,” he says.

Ray adds these opportunities allowed him to not only contribute his expertise, but also learn about the practical problems industry encountered. That meant his students had the benefit of working on new technologies and relevant problems.

Because the field was so new, Ray was able to attract the very best students and other researchers to his group, as well as research funds to support it. “My greatest satisfaction has been working with so many truly exceptional people, and seeing them go on to make significant contributions to both academics and industry,” he says.

Making his mark
Like many engineers, Carlos Enrique Garcia found his calling while doing his thesis. As a graduate student at the University of Wisconsin-Madison, Garcia was one of Prof. Manfred Morari’s first Ph.D. students. Morari consulted for the Shell process control group in Houston. It was led by the late Charles Cutler, who was a 2003 inductee to Control’s Process Automation Hall of Fame. Shell’s newly patented advanced computer control technology was the inspiration for his thesis. By the time Garcia finished his Ph.D., he’d already published five papers with Morari. One of them is still among the most referenced in its field.

The connections between Garcia and Cutler made it a natural fit for the up-and-coming engineer to also join Shell. “I could have gone into teaching, but I wanted to learn first-hand the practical challenges of implementing advanced technology in industry,” says Garcia, now retired after a 36-year career with the company.

Working with a legendary engineer within the company—Cutler developed the Dynamic Matrix Control algorithm (DMC), which made it possible to control and optimize the most challenging processes in the refinery—might have seemed like a great deal of pressure, but Garcia thrived and made a name for himself. In fact, Garcia became one of the pioneers of advanced computer control, especially MPC. “I witnessed the whole evolution,” he says. “Like in most other fields, increased computing power changed everything in control. You can go back to the 1950s, when many of the principles were developed, but deployments were limited by real-time computational capability.

“As computing power grew, users could solve larger problems that ran faster in real-time,” he continues. “The challenge has always been how to maximize the existing computational capability to deliver profitability.”

Garcia’s work exploited that computing power growth. As an individual contributor and manager of the control R&D group, he prides himself on the work he and his teams did in extending DMC technology with better computing engines, modeling and performance monitoring. He ended up writing more than 50 papers and three books.

His journey in learning industry’s practical challenges took a step up when he was 12 years into his career and was transferred to the company’s Deer Park chemical plant just east of Houston. He led a team of engineers, inspectors and technicians deploying and supporting instrumentation and control. He also managed the process engineering department.

After that assignment his career veered “out of control” as his friends joked. He returned to Shell’s head office to manage a global technology group supporting a new proprietary polymer business. His group oversaw the development and support of “first in the world” monomer and polymer plants. He learned a lot about the challenges of managing intellectual property and meeting customer requirements. Of course, he also ensured these new plants had the most advanced control technology.

Garcia’s career path took him back to control when he became manager of the control department at Motiva’s Port Arthur refinery, a joint venture between Shell and Saudi Aramco. The two companies have since dissolved their refinery partnership. He came at the time when a massive expansion project was being completed, turning it into the largest refinery in North America. “I was there to build the control group for the expanded operations,” Garcia explains.

But it was his last six years with Shell that saw him finally get his “dream job.” He was named global discipline head for automation, control and optimization—the highest position for a control engineer in the corporation. He was responsible for maximizing technology value for every Shell business—from upstream to manufacturing—as well as managing standards and skill pool development. It was a position that took him all over the world, where he met and managed control engineers from nearly every country where Shell operated.
“It was a fun and interesting career with new challenges in every assignment,” he recalls. “I was never comfortable where you just did the same old thing over and over.”

Garcia retired from Shell in 2018, when he thought he’d embark on a teaching and/or consulting position. However, he decided it was time to enjoy his other passions in life—his family, and especially spending more time with Griseida, his wife of 42 years, who he met while they were students in Wisconsin.

Carlos Garcia and his guitar (left); posing with wife Griseida (top center); hiking with his trusty camera (bottom center); touring a UFO museum in Roswell, N.M. (second from right); and posing with the Buddy Holly statue in Lubbock, Texas.

“One of my passions is music, so I sing at church and get together with my musician friends,” he says. He visits South Carolina often, where his son followed in his footsteps and became an engineer.

He and Griseida often travel to their native Puerto Rico to visit his in-laws.

As he sits back and reflects on 36 years of accomplishments, he simply says, “Now, I’m making music and memories instead of new technology and polymers.”

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LEVEL measurements using radar and guided-wave radar (GWR) have achieved many advances over the years. But more recently, they and other process control components have added microprocessors, software and Ethernet networking. These advances give them added intelligence and other support functions that make them easier to deploy and operate, especially by rookie users with less technical expertise. One of the primary manufacturers in level measurement is VEGA Americas Inc., which has been refining its radar and GWR solutions for decades, and is presently integrating data processing, communications and analytics with its level gauges, transmitters and support devices. To learn more about these innovations, Control recently talked with Greg Tischler, product manager for radar and GWR at VEGA Americas.

Q: Can you trace some of the history of radar and GWR level measurement to give us some context and understanding about the current state of the field?

A: We’ve always sought to make level measurement more accessible and usable, but 25 years ago, radar and GWR were specialty technologies that needed technicians to tweak parameters. This caused them to be used in low quantities, and they weren’t that popular.

Consequently, VEGA created devices that didn’t require users to be technicians to install them or make sure they ran effectively. Plus, we’ve refined them over time, so now users are just asked five questions to set up their radar level system.

They’re also more intuitive to operate, so users can focus instead on their process applications, whether they’re lift stations in a water/wastewater plant, grain silos or chemical reactors.

We’ve also added frequencies to make installation less critical. This means level measurement can be more forgiving, and mounting doesn’t have to be perfect. It used to require a lot of engineer ing to figure out the right mounting in vessels that would provide good level measurements. Now, users can just put them in and they work, which means more users can deploy them.

Q: If more users are deploying radar level measurement, are they doing it in more and different types of applications? If so, how have radar systems evolved to handle all of these diverse requirements?

A: Today’s radar sensors and system are designed to be mission-specific. For example, sewage lift stations typically run in ambient conditions, so they don’t need high-pressure or high-temperature level measurement. They can usually employ a simple radar solution designed just for that type of process, such as a radar system that runs at 40 psi and 180°F for $700-$800, instead of the more costly, one-size-fits-all devices of the past.

Meanwhile, if a process requires high-temperature or high-pressure capabilities, we have radar level sensors that can serve at up to 842°F and 2,300 psi for $8,000-$10,000 because they’re made of Hastelloy or ceramic. Each radar solution is designed to match individual process characteristics, so users can specify what makes the most sense for them. This is why we ask users about, not just their measurement ranges, but the materials they’re processing, and the vessels, reactors and other equipment they’re using. This lets us determine if they really need a high-end sensor, or a product family in the middle, or devices that can handle slumes or solids. All these characteristics are determined by the individual needs of the user’s application.

Q: What kinds of behind-the-scenes technologies enable these diverse radar level measurement capabilities and ease-of-use?

A: It takes some complex engineering to create interfaces for users that are simple. For instance, our second-generation radar chip is designed specifically for level measurement, and doesn’t rely on any commercial, off-the-shelf (COTS) components. This means it’s more adaptable because it can exactly match local frequencies, and it’s easily updated with the right specifications such as built-in diagnostics. As for networking, even though 95% of output signals are still 4-20 mA with HART, we’re seeing more Ethernet, and Ethernet-Advanced Physical Layer (APL) emerging, too. Ethernet-APL is like two-wire, intrinsically safe (IIS), power over Ethernet (PoE) for radar, but it’s less complex than other fieldbus protocols like Foundation Fieldbus or Profinet. Ethernet-APL is similar to 4-20 mA with HART, but it’s much faster, more reliable, and can deliver far more data.

This speed and bandwidth allow users to configure and integrate their radar level sensors with a web browser. They also enable radar sensors to keep track of their own electronics, measure and manage reliability, monitor voltage at the sensor, and track update rates for how often they’re providing measured values. All of these parameters were already recorded at the source, but now Ethernet or Ethernet-APL can transmit them out. In the future, we’ll get even more values, such as echo curves and other deep diagnostics.

Q: How can users make sense of all these available parameters? How can they determine which ones will be the most beneficial for them, and how can they implement them?

A: Our radar and GWR sensors and systems are easy to implement in safety systems, and they’re also menu-guided. Users only have to answer a few questions, and the device will tell them what proof tests are available.

For example, if a user is measuring the ambient water in a tank, the sensor on the vessel takes a measurement when it’s installed, starts a proof test at the push of a button, performs diagnostics, and indicates when the system is ready. Our radar systems tell you what they need, and guide you to it, including indicating which test they require.

In addition, because radar, GWR and other level measurement devices are running microprocessors and making network connections, they also need to establish and maintain cybersecurity. VEGA follows the IEC 62443 standard for the VEGAPULS 6X sensor and in our work processes and facilities because Ethernet and HART protocols are possible avenues for probes and intrusions. Even though intrusions aren’t likely via 4-20 mA, users still need to make sure their devices, operations and facilities are protected, so they can’t be used as points of entry for malware and potential cyber-attacks.

For instance, our VEGAPULS 6X radar level sensor has been certified as compliant with IEC 62443 by the third-party TUV Sud organization, so users can be sure our devices and their processes are secure. Because users know VEGA’s products and manufacturing are secure, this is one less headache for them to achieve their own IEC 62443 compliance.

Q: What are the best ways for users to learn about these advances in radar and GWR level measurement and the intelligent capabilities they’ve added recently? How can they apply these innovations to their own process applications?

A: We held classes, lab sessions and exercises via our myVEGA website, but they’re also available in the training center at our new headquarters just north of Cincinnati in Mason, Ohio. This is where users can work with radar and GWR components, push them to the edge, and see how well they’ll operate in their individual-level-measurement applications. Customers want to know everything that can happen and how to troubleshoot when it does, and this is where they can receive answers to those questions, and better articulate their specific needs.
IF there’s “a whole lot of shakin’ going on,” everyone wants to know about it—whether it’s related to Jerry Lee Lewis or Air Liquide’s compressors. However, the problem is some vibrations are more or less apparent than others, and some measuring devices don’t provide enough details about them. This means users can’t answer the question, “What’s shakin’?” or even know if they should be trying to find out.

To overcome these limitations, Air Liquide Large Industries (https://www.airlique.com/group/united-states-america) is upgrading the vibration-measuring components, support software and capabilities used by the air, O₂, H₂, and N₂ compressors in its many air-separation units (ASU) at four plants in Texas. These improvements are part of the company’s overall digital-transformation initiative, which includes revamping its distributed control systems (DCS) over the past few years (Figure 1).

“We’d already standardized on DeltaV and PK controllers, so we thought it might be good to use Emerson’s AMS 6500 ATG system to monitor vibrations on our compressors,” says Les Dupre, process controls and special products manager, ALLIUS Center of Technical Expertise, Air Liquide Large Industries. “6500 ATG also complies with the API 670 machinery protection system (MPS) standard, so we asked Emerson to help implement sensors, vibration racks, cabinets and condition-monitoring software and connect them to our DeltaV and PI Historian, which does predictive analytics with Aveva’s Prism artificial intelligence (AI) and machine learning (ML) software. This path was good for us because we integrated 6500 ATG into DeltaV and worked with Puffer.”

Salim Jaffer, business development manager for reliability solutions at Puffer-Sweiven (www.puffer.com), an Emerson Impact

Figure 1: Air Liquide Large Industries is upgrading the vibration-measuring components and support software used by the air, O₂, vertical reciprocating, H₂, horizontal reciprocating, and N₂, four-stage, centrifugal and other compressors in the air-separation units (ASU) at four plants in Texas. They’re adopting Emerson’s AMS 6500 ATG system to monitor vibrations; adding sensors, vibration racks, cabinets and condition-monitoring software; and connecting them to each plant’s DeltaV DCS and PI Historian that does predictive analytics with Aveva’s Prism AI and ML software. Source: Emerson and Air Liquide
Partner, adds, “Air Liquide also needed to upgrade its vibration-measuring technology because it previously used vibration switches, which don’t work as well with compressors.”

Air Liquide had used vintage 3300 and 3500 vibration racks and transmitters from Bently Nevada, but they only produced 4-20 mA signals and could only send rudimentary trends to the DCS. “However, we were able to keep the probe sides of the Bently transmitters, which was a significant savings,” adds Jaffer.

Dupre and Saffer presented “Vibration monitoring on ASUs at Air Liquide” at Emerson Global Users Exchange 2022 last October in Dallas.

Get a little help
It’s hard to overstate just how crucial vibration data is to maintaining Air Liquide’s compressors and ASUs, but it’s also costly to acquire this information.

“It may seem like air is the raw material in air separation, but it’s really the energy needed to compress air to the pressure needed for our processes,” explains Dupre. “We use centrifugal, multi-stage compressors with high-speed pinions, and we need to be aware of and measure vibrations of the bearings, seals and other areas to monitor, maintain and optimize performance. If an ASU trips, then our whole process goes down, and it’s costly to start up again. There are many advantages to good vibration monitoring.”

Dupre stated that extending its partnership with Emerson from process control into vibration monitoring provided several key benefits. These included:

• Unified product support from one supplier,
• Commissioning synergies,
• Cost savings by combining vibration racks with DeltaV in the same cabinets,
• One source for standardizing on vibration packages for all O2, H2, and N2 compressors, and
• Improved availability and reliability of the compressors.

“The biggest gain to this approach was the visibility of these production machines at a corporate enterprise monitoring center and deployment of prescriptive analytics on all machines,” says Dupre. “The aim is to take this to a global level from our Houston and local, U.S.-based plants. We’re expecting to use Plantweb Optics software provide more machine visibility at the enterprise level.”

Standardize and save
As it sought a common upgrade strategy for the ASUs’ compressors, Dupre reports that AirLiquide, Puffer and Emerson developed a standardized solution. “It became like a cookie-cutter, which is what Air Liquide wanted to achieve,” he says.

The company’s standard package for compressor vibration monitoring on its ASUs included AMS 6500 ATG racks; cabi-
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Drives and Motors

nets from Puffer; eddy current probes with EZ-1000 accelerometers from Emerson; and a network license for AMS Machine Works software, with a provision for increased capacity as more plants join the network.

So far, this vibration monitoring package with some variations has been installed on compressors at four Air Liquide facilities.

- Three O₂ vertical reciprocating compressors are installed at its plant in Channelview, Texas. They have a two-throw configuration, use AMS 6500 ATGs and include three racks with seven channels per rack.
- Two horizontal reciprocating compressors are in a hydrogen-carbon monoxide (HyCo) process at its plant in Freeport, Texas. One compressor has a six-throw configuration and the other has a four-throw configuration. They’re using two ATG racks.
- Centrifugal N₂ compressors are at its plant in Longview, Texas. This application uses one ATG rack and employs 10 channels per compressor.
- Seven N400A O₂ compressors are at its plant in Nederland, Texas. This is the largest upgrade project, which has 68 probes and six ATG racks, and it uses AMS Machine Works software, as well as Machine Studio software to configure the racks. It also employs Red Lion’s HMI displays, as well as AVEVA’s PI Historian and Prism software (Figure 2).

“These are big projects, but our goal with all of them is to give our subject matter experts (SMEs) rotating equipment data from many facilities, so they can optimize them,” says Dupre.

“Communications consist of OPC UA from fiber-optic to Ethernet switches that are linked to DeltaV and our plant networks, though this is all still at Level 1 of the Purdue OSI model. They bring in vibrations and other data, such as showing latches. We can also see alarm limits and put in bypasses without having to go out to the racks. We’re also getting better data to DeltaV from our devices, which we can see on our remote faceplates without physical visits. Eventually, we’ll be able to move this data up from Level 1 to other applications by using Plantweb Optics software.”

Just on the Nederland upgrade project, Dupre reports that Air Liquide estimates it saved $150,000 to $200,000 by unifying its vibration modernization and extending from DeltaV to other Emerson solutions. These savings included engineering expenses, design and documentation costs, training for global personnel, more efficient maintenance by more easily swapping uniform parts, and reduced costs for spare components by using Universal Measurement cards that incorporate all major vibration measurements, instead of using one card for each function.

“We also achieved about 8.9% total and value-added savings by integrating our individual AMS 6500 ATG and DeltaV panels into one cabinet with help from Puffer,” concludes Dupre. “In fact, we’re already planning to upgrade another seven racks at our plant in Baytown, Texas, in the second quarter of next year.”
Translating automation techniques to managerial decisions

Control engineers could help managers improve their methods

BY R. RUSSELL RHINEHART

THERE’S a process control way—an approach to looking at processes and determining how to control them. Managers seek to control organizational processes and outcomes, but most managers haven’t been trained in the methods of control. I think that control engineers and technologists could help decision-makers in management improve their methods.

Promote control concepts, not algorithms and theory
We have control algorithms such as proportional integral derivative, model predictive control, adaptive disturbance rejection control and sliding mode control. They take inanimate process data and enable those processes to influence decisions. Control technologists are comfortable with giving automatic decision-making capability to such processes, in low controlled and manipulated variable situations, where the one-algorithm rule works for every situation. However, I don’t think managers will let such algorithms have autonomous control over animate processes. The concepts behind the algorithms should be useful and acceptable.

We shouldn’t seek to promote control theory. Instead, we should help managers understand the fundamental concepts that relate to decision-making.

Similarly, we have several model types that have proven useful in control. These include first order plus dead time, autoregressive moving average, the modern control matrices model and finite impulse response. The best values for model coefficients aren’t important. The model functional forms aren’t important for those making managerial decisions in very complex nonlinear, constrained, multivariable and uncertain spaces. What’s important is the control insight from understanding the concepts behind the models.

What control tells us
First, understand your process. Know what reacts to what—and how. Use a phenomenological view, the sequence of mechanisms, and the timing. Know what you want to achieve and how to measure it. Know what you can manipulate (change) and how you must respond. Understand the difference between controlled variables, auxiliary variables and constraints.

Control keeps things at a setpoint. Keeping things the same isn’t improvement. Good regulatory feedback control improves uniformity, which can be leveraged to achieve process or organizational improvement by minimizing losses, reducing or eliminating upsets, improving uniformity, safely operating closer to constraints, increasing flexibility, providing surer and faster transitions, reducing false actions, and operating closer to just-in-time and supply-chain boundaries.

Rational assessment of key performance indicators (KPI) provides knowledge that leads to better decisions. Be sure to properly assess the objective. Errors in measurement could be from sensing the wrong thing, calibration error, etc., or even purposefully created in an effort to distort the situation to seemingly justify some action. If you want to do what’s right, be sure the measurement provides a legitimate representation of the goal.

P-action makes an immediate push to move the process back to a desired point or toward a new point. The magnitude of the push depends on the process sensitivity. Compliant processes don’t need a big push. Recalcitrant processes need a significant push.

I-action continually shifts the base controller push as the P-action fades as the
process moves. I-action is needed to continually adjust the control action or else there will be steady state offset. The rate that I-action adjusts the push depends on the rate that the process responds.

If the controller isn’t in charge, the I-action will cause the manager to wind up. Be sure the controller has the needed leverage and connectivity. Don’t try to control something that’s not controllable.

Desired change doesn’t come with an initial decision action. Control requires continual guidance.

D-action shows us to not just react to the current deviation, but to use rate of change to forecast the magnitude of the deviation a bit into the future. It also shows that extreme forecasting can lead to excessive go/stop messages.

When processes have long delays, or many stages are required to process the change, then the controller must be patient. It must give the process time to change, or else it causes overreaction.

Place sensors, assessments and measurements as close as feasible to the first possible indication. Eliminate delays and lags in information about the process state.

Noise in the measurement, the KPI, leads to noise in the controller action. When a process is noisy or uncertain, use statistical process control concepts to temper action, but wait until action is statistically, confidently needed.

On-off control is often good, but consider deadband around the measurement to prevent on-off chattering.

Override control reveals that some safety or emergency action will override a primary controller action, and when this happens, the out-of-control controller will wind up. You need to place primary ambitions on hold when there’s an override. Planning needs to shift the prior schedule, and annual performance appraisals need to recognize the override, and not hold employees or units to the normal schedule. When a project is placed on hold, those who invested their success in the project need to be unwound.

Cascade tells us to seek leading indicators or intermediate variables that reveal what’s developing in the process. If the leading indicators reveal all is on target, don’t take control action. But if the leading indicators reveal a change, don’t wait for the change to fully develop in the process; act now to counter that change. Use feedback control to adjust the desired value of the leading indicator.

Ratio control tells us to scale the control with the need. If something doubles, then double the control action. If hiring increases the new employee influx by 20%, expect to increase training sessions by 20%.

Feedforward has us also monitor disturbances, influences and indicators that reveal action will be needed. But unlike ratio, which reacts immediately, feedforward teaches us to wait until just before the disturbance has an impact, then jump the control action to an initial value, then relax back to a steady-state value based on the process sensitivity of the disturbance and the control action.

Interactions mean that control action to fix one thing can upset another. Multiple input/multiple output control teaches us several techniques to fix this problem. Provide decouplers, provide a one-way decoupler if one variable is relatively important, or detune the less-important control loop, so its corrections have little impact on the more important loop. The decoupler might be just a simple gain-scaled addition to one of the controller actions.

Multiple/advance process control tells us to forecast the possible impact of control actions into the future (constraints as well as desired outcomes) to see what acting now will requires in the future.

If you’re uncertain about your process, take cautious action. The process behavior changes in time and operating point. We think of key process attributes in terms of gain, time-constant and delay. We know appropriate control action needs to have an associated change. People mature and employees are replaced. Organizational size and procedures change. Financial and legal constraints change. Control action must change with the situation.

The process models we use in real-time optimization don’t account for future uncertainty, such as tax rates, labor negotiations, raw materials, utility costs and inflation. They don’t need to be accounted for because they run on an hour-to-hour or shift-to-shift frequency. However, managerial decisions might set a course that requires a multi-year period to come to fruition. Managers need to include future uncertainty in forming optimal decisions. Our work with stochastic models and concepts, such as weather forecasting of possible storm paths and probability of rain, could help managers see possible future outcomes, and intuitively choose the decision that minimizes the undesirable, while maximizing desirable outcomes.

**Takeaway**

Help your managers understand how to look at decision making. Don’t attempt to tell them what to do. Many are enjoying their new sense of authority, and don’t want underlings trying to formulate action. However, be willing to offer insight.

You can also manage your own arena and make your own decisions. Develop your potential. Use the way of control to guide your personal decision-making.∞

Russ Rhinehart had a 31-year academic career now coaches professionals through books, articles, and short courses on his website at www.r3eda.com.
Using vortex flowmeters in low-pressure steam applications

Also, keeping lines open with purging systems

Q: May I have your advice for a formula sheet to size a vortex flowmeter? Is the data below enough for specification and is there a specification form I should use? Could you advise if the use of vortex flowmeter is the best selection for a low-pressure steam application?

Steam flowmeter
Normal flow: 2,200 kg/hr
Pressure: 3 barg
Temperature: 144 °C

PARNINGGO BUTAR
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A1: Before answering your question, I’d like to tell you how the theory of vortex shedding was born and what role fishing and Saint Christopher played in its discovery. An observant young man named Tódor Kármán was fishing in a spring in Budapest and noticed that vortices form behind bluff-shaped rocks, but not behind streamlined ones.

He was fishing at the same spot one day after a rain and noticed the water was running faster, but the distance between the vortices that were shedding from alternate sides of his bluff rock was the same. That was because the change in water spread changed only the number of vortices, but not the distance between them.

Later, his class of engineering students took a trip from Budapest to Bologna and visted the great museums. While the other students just walked by a 14th century painting, the observant Tódor stopped. On the painting, the giant St. Christopher with a bluff-shaped walking cane in his hand was carrying little Jesus across a river. Tódor whispered: “The fish jump at equal distance and on alternate sides.”

It took Tódor some years to figure out that the distance between vortices has to do with the size of the bluff body. It was then that a key unit of traveling in air or water, the ratio of inertial and viscous forces, was discovered (Figure 1).

At the age 34, as a soldier in the Austrp-Hungarian army in WW1, he used that knowledge to design an early helicopter. Later, he advanced rocket science and became the first director of NASA’s space exploration laboratory, among many others. He measured the thickness of the earth’s atmosphere and after—besides being referred to as one of the “Martians”—he received America’s first National Medal of Science in 1962.

Now, coming back to your low-pressure steam application, the vortex flowmeter is a good selection. If you pick a 3-inch meter, it will measure a range of about 250 to 2,500 kg/h steam with an inaccuracy of about 2% of actual rate (not full scale). Keep in mind, the meter requires a high-pressure drop (2 velocity heads) and a fully-formed flow profile, so even at low flow, the Reynolds Number has to stay around 20,000, and a 20 diameter upstream straight run or a flow straightener should be provided. For a highly detailed discussion of the various designs of this meter, see the 5th edition of my handbook, and for a specification form visit https://www.instrumentspecsandin-dex.com/download.

BÉLA LIPTÁK
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Q: I’m a process engineer working at a visbreaking unit at Pak Arab Refinery. Visbreaking heaters reduce the viscosity of the bottom from a vacuum column through thermal cracking. The fuel for the heaters are either fuel gas or fuel oil. During the past two years, our high-pressure trips were falsely actuated. We found that this was caused by the pressure transmitter sensing lines being plugged with soot and smoke particles. Now, we’re considering a modification of its design. Please suggest some designs of a purging system that would be suited to keep our impulse lines open.

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This column is moderated by Béla Lipták, who is also the editor of the Instrument Engineers’ Handbook (5th Edition: https://www.isa.org/products/instrument-and-automation-engineers-handbook-proce). If you have a question concerning measurement, control, optimization or automation, please send it to: liptakbela@aol.com. When you send a question, please include full name, affiliation and title.
Figure 1: The distance (I) between the vortices only depends on the width of the bluff body, therefore the number of vortices per time unit gives velocity

Figure 2: From a maintenance perspective it’s important that the sensor assembly be removeable

Figure 3: If you’re still experience plugging, you can add sealed-manual or piston-operated automatic scraping rods

A1: If the temperature and pressure ratings are acceptable, a simple, extended diaphragm pressure transmitter might suffice—if you can clean the diaphragm periodically (when the unit is down). If you want continuous and automatic purging, use solenoid-triggered, periodic nitrogen blasting. It should come from above the impulse line (to take advantage of gravity). If you’re still experience plugging, you can add sealed-manual or piston-operated automatic scraping rods as shown in the adjacent figure.

BELA LIPTÁK
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A2: I don’t know of any purging standard, but some users and contractors will have their own. Purge gas supply pressure must be higher than the maximum pressure for which the system is designed. A check valve on purge the supply line is required. A “purge” rotameter with inlet end needle valve is commonly used. To purge air flow, something around 250 cm³/min is a common range. Adjust the flow to 50% with the needle valve. Because the purge pressure drop is across the needle valve, the flow is nearly constant despite pressure changes. It depends on the actual pressures.

Air is commonly used unless there’s some requirement for an inert gas such as nitrogen. In rare problem situations, we’ve used a second small liquid solvent purge to wash the dip tube. This must be added close to the process connection, and from that point on, the impulse line must slope downwards to the process.

CULLEN LANGFORD
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A3: Use a purge rotameter with service air. If service air isn’t dry enough, use instrument air. Still, you’ll have to schedule periodic blowing of the impulse lines. You can always implement a semi-automatic blowing system using solenoids, but the logic must be carefully written as you have low- or high-pressure trips, if it’s a balanced draft furnace

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A4: I remember an application in the alumina refining industry, where we measured the line pressure of the slurry line from the digester to atmospheric flash tanks. The slurry was used to plug the tapping points. To keep the tapping points clean, we used high-pressure water (slightly above the operating pressure) to wash away the slurry build up.

In your application, you could use nitrogen purge (inert gas) to achieve a similar cleaning action of your impulse lines. Please be aware that the measured pressure will be slightly higher than the actual value and you’ll have to compensate for it.

RAJ BINNEY
control engineer
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Flow’s grasp exceeds its reach
Sensors, transmitters and support devices improve accuracy, and expand functional ranges and networking

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The unrecognized challenges of process control

Some challenges of the past are possibly even more problematic today

**GREG:** In this month’s column, I converse with myself and take on the role of being a mentor. In Part 1, I focus on past challenges that are still present and possibly more problematic today. Here are the many challenges in the process industries that are often not recognized.

**MENTOR:** Processes are nonlinear with dead times, time constants, and gains that change with production rate and operating conditions of the process, as well as the design and installation of the instrumentation. Process dynamics can often change by a factor of four or more when changes in production rate, operating conditions, startup and hidden factors come into play.

In addition, pH control with a strong acid or strong base can exhibit one or more orders of magnitude changes in process gains that are highly dependent on operating point. The effect of signal filter times and execution intervals are often unrecognized in terms of increasing loop dead time and hiding the true variation in the process, being particularly detrimental to fast loops.

**GREG:** What’s the general availability of process control algorithms needed?

**MENTOR:** Key capabilities in PID and MPC are not widely available. Surprising and disappointing is the loss of external-reset feedback capability in most PID in the evolution of pneumatic controllers into analog and digital controllers. Some PLCs do not offer the standard PID form, and a few even more disruptively use engineering units often seen in academic literature instead of percent of controlled variable and percent of manipulated variable in their algorithms. The fact that the PID algorithm fortunately works with percent input and output signals in nearly all industrial PID is not commonly recognized. Just imagine the PID gain setting for a flow controller with a scale of 0 to 200,000 kph.

**GREG:** What testing is needed?

**MENTOR:** Methods that propose to identify process dynamics from closed-loop operation are inherently flawed due the effects of control algorithm design and implementation. Control loop variability is transferred from the controlled variable to the manipulated variable by PID and model predictive control (MPC). The tighter the control, the more the disturbances are seen in the manipulated variables.

**GREG:** What are some of the additional challenges in process dynamics?

**MENTOR:** Besides processes having complex dynamics, including inverse response, there are many processes with an integrating response (level, gas pressure, batch pH) and a few with runaway responses due to positive feedback (highly exothermic reactors).

**GREG:** It’s been proven that the PID is the best control algorithm for process input disturbances, whereas the academic literature commonly shows process output disturbances. What’s the reality?

**MENTOR:** Measured and unmeasured changes in process inputs, most notably in stream composition, flow, pressure, temperature and physical properties, are prevalent in the process industry. There are also equipment condition changes that affect mass transfer and energy transfer, reaction rates and phase changes, such as surface fouling and catalyst deactivation. These are classified as load disturbances.

The stream conditions shown on a process flow diagram are rarely constant or exactly match what’s happening in the process. Load disturbances can be extended to include any change in process parameters for the material and energy balances. Every PID controller can deal with these differences, otherwise automatic control would not be necessary, and simply setting the PID controller at a fixed manual output for a given production rate would be sufficient.

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**GREG MCMILLAN**

Gregory K. McMillan captures the wisdom of talented leaders in process control, and adds his perspective based on more than 50 years of experience, cartoons by Ted Williams, and (web-only) Top 10 lists. Find more of Greg’s conceptual and principle-based knowledge in his Control Talk blog. Greg welcomes comments and column suggestions at ControlTalk@endeavorb2b.com
GREG: What about signal filtering?

MENTOR: Filter time must generally not be larger than 20% of total loop dead time and reset time to prevent appreciable deterioration PID performance ultimate and practical limit, respectively. Most don’t realize that a filter time larger than the process time constant can make trend recordings look better due to attenuation of what’s really happening.

I was at a conference where the presenter said his company almost didn’t let him do his presentation because it wanted to keep the knowledge proprietary. The presenter had enormously increased signal filter time, which enabled an incredibly smooth response to a disturbance seen in the trend recording of the filtered signal. He didn’t realize and show the reality that the unfiltered controlled variable error was horrendous.

GREG: What’s the most common mistake in tuning?

MENTOR: People tend to use too much integral action because it behaves the way they would by not proactively reversing the direction of the manipulated variable until the error changes sign to deal with inevitable dead time in the loop response. If there’s an oscillation, they tend to think the cause is too much gain action. If the oscillation period in the process variable is more than 10 times the dead time, the cause is most likely excessive integral action. If the period is 10 to 30 times the dead time, the cause is most likely stiction, so amplitude can be decreased by increasing the PID gain. If the period approaches or exceeds 40 times the dead time in a lag-dominant, integrating or runaway process, the cause is most likely the product of the PID gain and reset time being too small, which is most often caused by an integral time that’s too small but in some cases a PID gain that’s too small.

There’s a window of allowable gains that can pose severe safety issues for processes with positive feedback. If the PID gain is too small, the controlled variable in a runaway process can accelerate to a point of no return, causing a shutdown and relief devices to blow, and endanger equipment and people.

GREG: What’s the most common mistake in feedforward control?

MENTOR: The literature tends to show a feedforward multiplier, which is reserved for dead time-dominant processes. Other processes have a change in process time constant that counteracts the change in dead time with a feed-flow change. A feedforward summer is easier to implement and more in tune with the process.

GREG: A big personal concern is the loss of recognizing the value of PID control and the loss of expertise. Management increasingly focuses on budgets and schedules with a business instead of an engineering background. The tendency towards copy jobs causes a loss of practical control experience, which is underestimated in its long-term impact. Users don’t have as much time or inclination to read articles and books about process instrumentation and control.

Chemical and especially biological production companies don’t encourage and may even prohibit publication of learning experiences from successful applications. Unfortunately gone are Greg Shinskey, the world’s greatest PID expert, and Peter Harriott, professor emeritus at Cornell University, who authored the book “Process Control” that alerted me to an equation for PID peak error and issues in heat exchanger control.

Most experts I know are in their 70s or approaching their 70s. This includes the academics who wrote great books on the practical applications of PID control, such as Karl J. Astrom, Thomas F. Edgar, William L. Luyben, Duncan A. Mellichamp, James B. Riggs and Dale E. Seborg. The result is that the capability of the PID is increasingly underutilized. My creation and leadership of the committee that recently completed and got approved the ISA-TR5.9 PID Algorithms and Performance Technical Report is an attempt to turn this around.∞

For an extended version of this article and to read the Top 10 things you don’t want to hear about process control, visit ControlGlobal.com
Don't lean on labels

Specifics and accurate definitions enable clearer thinking

**TALK** is always cheap, but never more so than now, when the supply is so huge due to ceaseless yammering on all sides. The added problem is that almost limitless digital storage creates a vacuum—much like the 24-hour news cycle—that sucks in more and more material just to fill space, regardless of how increasingly useless it is.

This situation makes it crucial to prioritize access points and input at the source. To set up perimeters for the data they gather, some process industry users are defining parameters based on problems they want to solve or benefits they want to gain. These boundaries can serve as filters to separate out useful data in the field, so users can perform better analytics onsite or in the cloud.

This is a helpful strategy that can be used in many areas beyond process control.

Of course, the risk of prioritizing input is we may be too restrictive, and filter out some priceless piece of intelligence that could have added value of made another positive difference.

Logically, better, more discriminating filters are needed that catch more potentially helpful data. In the case of incoming information, this means clearer and tighter definitions about what we’re seeking and what we want to keep out.

Likewise, when I’m researching and preparing for interviews, and I try take some added time to develop some really thoughtful questions. Even after many years, it’s still surprisingly difficult. This is because I’m not just probing for details. I’m trying to come up with questions that will spark the imaginations of the people I’m interviewing, allow them to blossom, and provides some experiences and advice for our readers that will help them improve how they do their jobs.

In my case, I’m usually trying to filter an endless flood of vague generalities, nebulous statements and other noise that makes uninteresting copy and boring stories. We’ve all seen statements like, “Cybersecurity is important, we should have more of it,” but no specifics about how to do it.

Besides being pointless, these vague statements do little or nothing to dispel ignorance and enlighten readers, and merely perpetuate fuzzy, disorganized and often fearful thinking. Sadly, this seems to be the point of some media outlets, which too often create or exacerbate crises to maintain attention and revenue—even if that attention is gained by deceit.

For instance, many mainstream items use hyperbolic language like “torched” or “destroyed” to make themselves sound important, but all that happened was someone criticized someone else. Ho hum. Granted, they use active verbs, but nothing substantive occurred. Naturally, a vacuum will eat garbage if it’s all that’s available.

You can check for yourself. Even within the process industries, when you read a news item or another story, just ask yourself if anything really happened. I think eight or nine times out of 10, the answer is “not really.”

Similarly, many of the hospitals and health systems I used to cover seemed to be constantly renaming their organizations apparently to justify their existences—even if it meant getting rid of name recognition their organizations spent decades building in the first place. Thankfully, there’s less of this pointless wheel-spinning in the process industries because they’re mostly focused on producing actual products that consumers depend on. Meanwhile, the press in general and trade journalism in particular produce increasingly less-solid products, and are already uncomfortably close to sketchy facilitators. Consequently, I try to self-check frequently, and ask myself if the stories and content I’m putting together are truly useful? I must admit that I don’t always past the test.

This is why precise definitions, labels, question, examples, experiences, lessons learned, advice and other news you can use are so important— not just for readers, listeners and viewers, but also for those producing them. They don’t just reach the truth. They enable clearer thinking, which helps individuals, organizations and communities get on the same page, decide which direction they want to move, and make real progress.
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