innovations
in Process Automation

Emerson flagships – our best-selling and game-changing automation technologies
Emerson has built a reputation for innovation and developing disruptive technologies that help our customers achieve measurable operational improvements. Central to Emerson’s ability to solve the industry’s toughest challenges is being able to offer the world’s most comprehensive portfolio of process automation technology. Emerson’s recent technology developments such as Pervasive Sensing™, I/O on Demand and Plantweb™ digital ecosystem are transforming the process automation landscape. Supporting these recent headline-grabbing developments are a host of class-leading technologies that have been providing the backbone of plants’ automation systems for decades and which are continuing to evolve and offer further benefits.

In this edition of Innovations in Process Automation, we highlight some of these ‘flagship’ products. We explain why their introduction reshaped their respective marketplaces, and detail the enhancements that have helped them maintain their esteemed status within the industry.

Among these products are Emerson’s ubiquitous DeltaV™ distributed control system (DCS) – more than 15,000 of which have been installed worldwide – and its Ovation DCS, which provides robust control specifically for the power generation and water/wastewater industries. We reveal the transformative effect created by the unique design of the Rosemount 3051 Pressure Transmitter, and describe what makes Micro Motion ELITE Coriolis Flow and Density Meters and Model 5700 Transmitters the ultimate flow measurement solution. We also explain why Emerson’s Fisher final control element sets the industry standard for dependability and longevity, and what lies behind the outstanding performance and reliability of Emerson’s Vanessa Series 30,000 triple offset valves in isolation applications.

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Roel Van Doren
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Emerson Automation Solutions

Innovative control system that revolutionised the market
Innovative and durable triple offset valve increases safety in isolation applications
Unique design leads to world’s most popular pressure transmitter
Robust control helps ensure reliable power generation, maximising plant availability
Flexible and reliable control valve helps improve plant efficiency
Flow measurement solution supports operational certainty
The need for a scalable, cost-effective solution to exploit smaller-size application opportunities inspired the development of Emerson’s DeltaV system. When launched in 1997, DeltaV revolutionised the control systems market, being the first industrial DCS based on Ethernet and PC-based workstations that provided intelligent field communications using HART® and fieldbus protocols. Since then, DeltaV has seen some tremendously innovative enhancements that support implementation, operation and system maintenance. It has consequently become the most ubiquitous control system ever conceived, with more than 15,000 installed worldwide, clocking up over 12 billion operating hours.

DeltaV was designed to be easy to use, ensure safe, reliable process operations, protect assets and improve process availability. By offering an Ethernet control network and PC-based workstations, DeltaV created a significant benefit in terms of affordability. From the beginning DeltaV has been a modular system, enabling users to implement a small application and then scale up as required without adding complexity or change out material. It pre-empted the Industrial Internet of Things era by seamlessly connecting intelligent field devices and embedding applications, such as AMS asset management software, to enable predictive maintenance to be applied on industrial plants.

DeltaV started as a small system, but can now be applied to any process automation application with the highest availability requirements. Any component in the system can be made redundant, avoiding single points of failure that can shut down the system.

The out-of-the-box templates and modular configuration libraries of DeltaV require little specialised knowledge to operate, resulting in easy configuration and reduced testing. DeltaV is easy to integrate with other manufacturing and IT systems, and its inherent integration extends to areas such as advanced control and simulation. Advanced control is an effective tool in helping plants optimise operations and quality. Unlike other control systems with layered advanced applications, DeltaV Advanced Control functions reside in the DeltaV controllers, using the same engineering environment, configuration database and hardware platform for unprecedented availability and ease-of-use.

Expanding the range of DeltaV applications to include safety instrumented systems (SIS) was a key phase in its development in 2005. DeltaV SIS is the first standalone or integrated SIS to integrate HART communication and configurable I/O. It continuously runs logic to control safety devices and diagnoses the health of the entire safety loop, providing safer, more reliable process operations.

In 2017, two major evolutions, DeltaV Mobile and the DeltaV PK Controller, further expanded the system’s breadth of applications. The DeltaV PK Controller is the process industry’s first controller that manufacturers can scale down for skid units or scale up to be natively merged into the DeltaV DCS in a larger plant. It can be used for effective, easy-to-implement standalone automation control like a PLC but with the features of a full-scale DCS, including advanced batch production, recipe management, execution and historisation. DeltaV Mobile uses smartphone technology to make real-time process data, trends and alarms securely available 24/7, beyond the control room.

For more about how DeltaV can help improve your plant’s operations, visit emrsn.co/IM1301

“Innovative control system that revolutionised the market”
Innovative and durable triple offset valve increases safety in isolation applications

Isolation valves stop and start the flow of gas and liquids, typically for safety or maintenance purposes. Having full confidence in them is essential, because failure to provide this containment when required and within permitted leakage parameters, poses a safety risk. It is therefore vital to select valves that have been designed and tested to provide the requisite standard of performance and reliability, particularly in applications involving hazardous materials. Consideration should also be given to factors such as valve size, weight limitations and the effects of corrosive process materials. To successfully address these matters, valves need to be both compact and robust.

For centuries, process isolation has been performed using linear movement valves such as gate valves. Although this design is quite safe, over the past decades there has been a surge in the use of quarter-turn valves, because of their tighter shut-off capabilities, functional versatility and more compact design. TOVs are quarter-turn valves which revolutionised the isolation valves market, as the combined effect of their three offsets provided optimal sealing performance and longevity, establishing them as an ideal choice for harsh process conditions where safety and reliability are essential.

In 1975 the Vanessa Series 30,000 provided a significant advance by becoming the first TOVs capable of providing bidirectional zero leakage. That means there is no visible leakage when the valve is tested at high pressure with water and at low pressure with air, according to existing international standards. It achieves this by eliminating any rubbing action of the sealing elements during the entire 90° rotation, throughout which an extremely low running torque is constant. A single, instantaneous contact between sealing elements is delivered only when a closed position is achieved, enabling full tightness to be provided at the maximum rated pressure in both sealing directions. This capability led to worldwide success, and continual innovation in product design and material selection has since provided ongoing benefits for users in terms of safety, reliability, ease of maintenance and low cost of ownership. There are now more than 300,000 Vanessa Series 30,000 valves in operation around the world.

The engineering expertise, state-of-the-art technology and manufacturing capabilities behind Vanessa Series 30,000 TOVs ensure that they continue to provide optimum reliability across a wide range of applications. Their fully metal-seated design, coupled with their combination of robust, flexible and corrosion-resistant materials, ensures that they are unaffected by severe temperature fluctuations. This makes them a reliable solution for both high temperature and cryogenic applications. They have been certified to SIL 3 since 2005, making them suitable for emergency shutdown, including valve emergency open and close applications.

A key reason for the success of the Vanessa Series 30,000 TOVs is that they are designed to be virtually maintenance-free. In most applications planned maintenance is not required, helping to minimise lifecycle costs. In severe service applications, the replacement of some parts may be necessary over time. However, the streamlined valve design ensures that replacing parts is a straightforward task which can be performed without the need for special tools.

The reliability and performance provided by Vanessa Series 30,000 TOVs means they are now often being selected instead of gate, ball or globe valves, not only for isolation and emergency protective functions, but also for on-off process control functions (including heavy duty process switching applications), combined flow/pressure control and shutdown capabilities and, more recently, for double block and bleed and double positive isolation. Across all these cases, Vanessa TOVs enable users to achieve substantial savings in terms of space, weight, transportation, installation and insulation.

For more on how Vanessa Series 30,000 TOVs can help your plant processes operate safely and efficiently, visit emrsn.co/IM1302
Enhancing ease-of-use, the Rosemount 3051 has a local operator interface (LOI) which provides straightforward menus and both internal and external configuration buttons, enabling on-the-spot commissioning in under a minute. Standardising on the 3051 with LOI for pressure, flow and level applications results in simplified, consistent configuration procedures, and reduces investment in maintenance tools, training and overall cost of ownership.

Learn more about how Rosemount 3051 Pressure Transmitters can reduce costs and improve measurement performance at your plant by visiting emrsn.co/IM1303

Unique design leads to world’s most popular pressure transmitter

Emerson’s Rosemount 3051 Pressure Transmitter created a sea change when it was introduced. Phil Bond, Vice President, Rosemount, Europe, describes how its Coplanar™ design, along with subsequent continual innovation, has led to more than ten million devices being installed globally.

Measuring liquid, gas and steam pressure is a basic requirement for many industrial processes to operate safely and efficiently. Pressure measurements can be used to determine or infer flow rates, fluid levels, product density and other vital parameters. Consequently, plants rely heavily on the accuracy and reliability of their pressure measurement devices. When Emerson’s Rosemount 3051 Pressure Transmitter was introduced in 1988, its unique Coplanar design and outstanding accuracy and stability transformed the market.

Previously, pressure transmitters typically used a biplanar design, with process-isolating diaphragms on either side of a sensor module. This requires two separate process flanges, to which various connections and manifolds must be bolted. However, with a coplanar design, the diaphragms are placed side-by-side on the bottom of the sensor module. This creates a flat interface needing only one process flange and allowing the module to be connected directly to many types of process connections. Eliminating process flanges significantly reduces size and weight, while integrated pressure, flow and level assemblies can be easily installed out-of-the-box. This reduces complexity, labour and costs, and improves reliability, even in the harshest environments. As the transmitter is so compact, it can be mounted directly to the process. This eliminates the need for impulse lines and reduces leak points by at least 50% compared with biplanar installations, therefore improving measurement performance.

These advantages are a key reason why the Rosemount 3051 has become the world’s most popular pressure transmitter, with over ten million devices installed globally. The patented coplanar design has remained constant, but its reference accuracy and calibration stability have improved significantly. When released, the device had an accuracy of ±0.1% and a one-year installed stability, both of which were game-changing. These figures were subsequently improved to ±0.04% accuracy (±0.025% for the Rosemount 3051S) and ten-year stability. This reduces both process variability and the frequency of calibration requirements.

Emerson has made other significant enhancements to the Rosemount 3051 over the years, providing additional benefits. To improve reliability, a Power Advisory predictive diagnostics tool enables the identification of electrical loop issues at the instrument or anywhere in the loop before they cause a loss of measurement. Such issues might include water or corrosion in the terminal block or junction boxes, wiring problems, or power supply failure. Power Advisory can help prevent costly plant downtime and minimise the time spent diagnosing and resolving the root cause of measurement issues.

Helping to increase the safety of workers and increase process insight, the introduction of Emerson Wireless technology into the Rosemount 3051 provided a reliable way to wirelessly monitor assets, while reducing the need for field trips to remote and potentially hazardous locations. Wireless technology enables new measurement points to be easily and cost-effectively added, even in areas of a plant which were previously inaccessible. The greater process insight gained from these precise and stable measurements enables the most informed decisions to be made, leading to increased productivity, quality, energy management and safety.

To meet the most demanding safety application requirements, the Rosemount 3051 is certified for use in safety instrumented systems up to SIL 3. This enables the time between proof-tests to be extended to five years and helps in avoiding extra shutdowns for safety testing.

“Launched 30 years ago, the Rosemount 3051 is the world’s most popular pressure transmitter – over ten million devices installed globally.”
It is imperative that power generation plants operate at peak efficiency and maximum availability, to be as responsive and flexible to demand as possible. If a plant cannot respond to demand due to an unplanned outage, it directly affects profitability, so it is essential to implement a robust and reliable control system which can maximise availability and productivity.

Emerson’s Ovation DCS is purposely designed for the power generation and water/wastewater industries, and has become synonymous with providing robust control. Five decades of Emerson expertise have resulted in Ovation providing an innovative platform that safely evolves with technology to help ensure plant availability. That expertise extends across all commercial generation applications, from renewables such as hydro, biomass, waste-to-energy, solar and wind, through conventional fossil fuel applications, to others such as nuclear, combined heat and power, and district heating.

Since Ovation was launched in 2002, more than 5,000 systems have been installed worldwide, 30% of which are running plants based on renewable sources. These systems are in control of more than 1.3 million MW of the installed capacity across the globe and are therefore responsible for the supply of approximately one-third of the world’s power generation. Of the world’s ten largest power stations, nine are Ovation-controlled. In the power generation industry, Ovation has a market participation of over 50% in both North America and China.

Power stations typically have complex, non-integrative automation solutions based on multiple systems for separate control islands across the site. This results in inefficient unit control and increased maintenance and training costs. However, Ovation enables the integration of all plant aggregates as well as control, protection and monitoring functionalities into a single platform. Its integrated machinery health monitoring and protection capability eliminates the need to integrate standalone machinery health monitoring systems, and therefore reduces potential points of failure.

The Ovation system is ultra-reliable, natively redundant, non-client server dependent, and with an open structure to provide exceptional system availability, ease-of-use, simple configuration and reduced maintenance and training costs. Having a single integrated automation platform enables data aggregation for plant-wide analysis and sound decision-making, and helps to protect the plant more easily against cybersecurity threats.

To resolve conflicting timelines for hardware and software updates, Ovation can be implemented using Virtualization. Virtualization decouples the Ovation workstation hardware from the operating system and applications by replicating the operation of the physical CPU, hard drive and network interface on a virtual machine. Each virtual machine runs its own operating system and can be loaded with various software applications.

Emerson has taken the integration approach one step further by embedding simulation algorithms in Ovation. Sharing the engineering, configuration and visualisation tools of the process control application, ensures that the simulator can be configured and maintained by anyone familiar with Ovation. An example of how Ovation is helping customers can be seen at Engie Energy’s Maasvlakte Power Station in Rotterdam, Netherlands. Engie contracted Emerson to supply an Ovation DCS for the new-build 800MW power plant. The system was delivered, but did not become operational until the plant was commissioned three years later. This delay placed the system’s workstation hardware towards end-of-life at the same time as software updates were to be implemented, thus straining a maintenance budget that was only halfway through its cycle.

To resolve the conflicting timelines for hardware and software updates and budgeting, Engie worked with Emerson to implement a Virtualization project that economically upgraded the DCS’ architecture to the latest technology. This resulted in a 70% reduction in workstation hardware and associated maintenance costs; 90% faster inspection of control system health; a 75% decrease in control system patch installation time; and a two-year DCS hardware lifecycle extension.

For more on how Ovation can help maximise your plant’s availability, visit emrsn.co/IM1304

Ensuring peak efficiency and maximum availability is of paramount importance for power plant operators. Rolf Hemminga, Vice President Europe, Power and Water Solutions, explains how Emerson’s Ovation distributed control system (DCS) can help them achieve that goal by providing a single platform for the whole plant.

Robust control helps ensure reliable power generation, maximising plant availability
Flexible and reliable control valve helps improve plant efficiency

Reliability in the final control element is vital in reducing unplanned downtime and increasing plant efficiency. Eric Saussaye, Vice President Fisher Europe, explains how Emerson’s Fisher final control element provides an accurate, reliable and easy to maintain solution which continues to set the industry standard for dependability and longevity.

Process equipment failure is responsible for almost half of all unplanned plant downtime. With emergency maintenance costing on average around six times more than when performed during a scheduled shutdown, unplanned downtime has a major effect on operational efficiency and costs. As a typical process plant will have hundreds or even thousands of valves in operation, paying special attention to the final control element can be an efficient way to extend the time between shutdowns, improve plant reliability and increase profitability.

The need for reliable final control elements that require minimal maintenance goes some way towards explaining why Emerson’s accurate and dependable Fisher easy-e™ sliding-stem control valve can boast 2.4 million sales worldwide. Installed throughout all process industries, the Fisher easy-e is the proven standard for reliability and easy maintenance.

The Fisher easy-e design results from extensive flow testing and evaluation, which yielded a robust control valve that sets the standard for dependability and longevity. The drop-in cage, valve plug, and seat ring are constructed of hardened stainless steel, and are precision manufactured to ensure smooth and long-lasting operation. Their design enables quick inspection and reduced maintenance time, whilst the valve body remains in line.

The Fisher easy-e is available with connections for Nominal Pipe Size (NPS) 1⁄2" through to 36" and with pressure class capability. This versatility enables users to maximise control for any application, ranging from general service to severe service, while minimising inventory costs. Proven cage-guided technology enables the Fisher easy-e to provide an extensive range of flow capacities, while severe service trim sets reduce noise and eliminate cavitation.

The reliability and performance of the Fisher easy-e was enhanced significantly with the launch of the FIELDVUE DVC6200 digital valve controller in 1994, the first HART communicating positioner in the world. Having since evolved to the DVC6200, this latest generation instrument is used to accurately position the control valve by translating signals from the control system and adjusting the air to the actuator accordingly. The DVC6200 not only provides greater control, but its large communications capability (HART, FOUNDATION Fieldbus, PROFIBUS) offers a range of safety and diagnostic features, communicating effectively with every host.

The diagnostic capability of the DVC6200 provides valve performance and health evaluation without shutting down the process or pulling the valve assembly from the line. When used with ValveLink™ software, it includes a range of on-line and off-line diagnostic features. This enables the building of proactive and predictive maintenance strategies to help prevent unplanned downtime. As process and diagnostic information can be accessed remotely, the DVC6200 makes it easier to evaluate valves installed in hard-to-reach locations, and enhances safety by reducing worker exposure to hazardous environments.

Further enhancing Emerson’s desire to minimise maintenance requirements, the high performance, linkage-less feedback system of the DVC6200 improves reliability by eliminating physical contact between the valve stem and the positioner. Because there are no wearing parts, maintenance is minimised and lifespan of the instrument maximised. The instrument also has fully encapsulated electronics that resist the effects of vibration, temperature, and corrosive atmospheres.

The increased valve performance and diagnostics provided by the FIELDVUE DVC6200 digital valve controller has led to over two million instruments being installed worldwide. This, combined with the accuracy and reliability of the Fisher easy-e control valve, has created a flagship product for Emerson.

To learn more about how Emerson’s Fisher control valves can help improve your plant efficiency, visit emrsn.co/IM1305 and emrsn.co/IM1306.
Flow measurement solution supports operational certainty

Liquid or gas flow measurement accuracy and reliability is essential but, for many applications, having absolute confidence in these elements requires a measurement solution offering predictive health monitoring and analysis of process condition changes. Per Karlsson, Vice President Flow Solutions Group Europe, explains how Emerson’s Micro Motion Coriolis Flow and Density Meters meet this requirement and have become the ultimate solution for challenging flow measurement applications.

Since Emerson pioneered the first Coriolis flowmeter in 1977, the technology has completely revolutionised the industrial flow measurement market. Emerson’s Micro Motion ELITE Coriolis Flow and Density Meters offer a highly accurate and reliable flow measurement solution. They are not only easy to install and unaffected by fluid properties and process condition changes, but also offer real-time density, concentration and temperature measurements. These significant benefits have led to widespread adoption within process industries, with more than one million meters installed worldwide.

Continuous development of Micro Motion ELITE Coriolis meters enables them to now provide accurate measurement of almost all types of fluids, achieving an industry leading ±0.25% mass flow accuracy for gases, ±0.05% for liquids, and ±0.2 kg/m³ density accuracy for liquids. They also have an excellent turndown ratio, allowing them to handle applications with very high or very low flow. Because of this, Micro Motion ELITE Coriolis meters are installed in the most critical process measurement applications. These include gas custody transfer on offshore platforms, precise filling applications in the life science industries and safety instrumented systems in chemical plants.

In addition to meter performance enhancements, Micro Motion transmitters have also seen continuous improvements, with a focus on ease-of-use, smart diagnostics and the availability of a complete range of communication protocols to enable implementation within all digital plant architectures.

An example of this can be found in Emerson’s Model 5700 transmitters, which include the latest version of Smart Meter Verification (SMV), an easy-to-use, automatic diagnostic tool that monitors meter performance without having to interrupt the process. SMV provides a complete assessment of the meter’s health using a unique integrity test, which measures the stiffness of the meter tubes to determine whether they have been affected by coating, erosion or corrosion. Recognised by third party authorities such as NMI, it allows end users to reduce maintenance costs by extending the meter proving or calibration intervals. Quick and simple to use, SMV also offers the user full traceability. Supporting this functionality, Model 5700 transmitters also feature a Zero Verification tool, which determines whether the meter’s factory calibration is correct and indicates when a ‘re-zero’ needs to be performed.

Multiphase flow always poses a challenge for complex processes. However, Emerson’s Advanced Phase Measurement software, embedded within the Model 5700 transmitters also feature a Multi Phase Verification tool, which determines whether the meter’s factory calibration is correct and indicates when a ‘re-zero’ needs to be performed.

For more about how Micro Motion ELITE Coriolis Flow and Density Meters and Micro Motion Model 5700 Transmitters can help improve plant performance visit emrsn.co/IM1307 and emrsn.co/IM1308. This enables the Model 5700 transmitter to provide a window into your process and with extensive memory capability, they give easy access to detailed measurement history. This helps end users to optimise their processes and operations, which ultimately equates to increased plant profitability.

The combination of class-leading meter performance and smart transmitters contributes to greater operational certainty, reducing maintenance cost, production downtime and process incidents.
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