innovations
IN PROCESS CONTROL

EXPERT PARTNERING

Improve Reliability

Ensure Safety

OPERATIONAL CERTAINTY

Minimise Emissions

Optimise Production

EXPERT PARTNERING

Emerson targets $1 trillion in industry losses with Operational Certainty programme. Full story on page 4.

Welcome to
innovations

Making a difference

Connected Services helps reduce steam consumption

Connected Services from Emerson have helped one of the world's largest facilities for continuous polymerisation to reduce its steam consumption by approximately 7%.

Denka Singapore's Seraya plant produces polystyrene resins using steam as a key process heat source, and the steam system stretches throughout the plant. Within the system are steam traps which remove condensate from the steam lines. The harsh operating environment results in steam traps having a short lifespan and faulty steam traps cause steam loss or inefficient heating, leading to increased costs.

Denka had been conducting yearly manual steam trap surveys to identify failures. However, the fact that up to 20% of the plant's steam traps could be faulty at any time, coupled with such long inspection intervals, meant that a large amount of steam was being lost at a significant cost to the company. To solve this problem and increase profitability, Denka turned to a breakthrough solution provided by Emerson's Connected Services, based on the Industrial Internet of Things (IIoT).

As part of its Plantweb™ digital ecosystem for securely implementing IIoT, Emerson installed wireless acoustic transmitters to automatically monitor 148 critical steam traps. Data from the steam traps is gathered and

transferred to the cloud, where an app algorithm analyses it, detecting failures in minutes. At Emerson's global Pervasive Sensing™ Centre of Excellence in Singapore, staff extract the steam trap health reports, listing pertinent information that Denka's maintenance team require. A report is then emailed to Denka, and it enables their maintenance team to replace failed steam traps earlier, thus producing significant savings.

As part of the service contract with Denka, Emerson not only provides the monitoring equipment but also looks after the health of the wireless networks and transmitters. Plant personnel can also contact Emerson's domain experts regarding the steam traps.

Emerson's Connected Services have transformed work practices at the plant. Steam traps are now replaced based on health reports instead of yearly manual surveys. Productivity has improved, steam consumption has decreased, and the plant's carbon footprint has been reduced. In the future Denka also plans to use Connected Services to improve further maintenance practices, including monitoring the vibration of cooling tower gearboxes to detect developing problems early.

Learn how Connected Services can remotely monitor critical plant assets and processes at Emerson.com/IM101

> *"The weekly exception reports provided by Emerson become work orders for the maintenance team and have enabled us to reduce the steam consumption by approximately 7%."*
>
> **Ng Hock Cheong, Maintenance Manager, Denka Singapore Pte Ltd**

Over the past year, Emerson has analysed the operational performance of industrial companies in order to identify behaviours and actions that separate Top Quartile performers from those in the lower tiers.

Through close cooperation with benchmarking companies and talking to our customers, we have gathered industry-wide data on the challenges companies face in core areas like safety, reliability, production and energy/emissions. Our findings show that across the global industrial sector, annually as much as $1 trillion is lost as a result of subpar performance.

It is clear that there is an enormous potential for improvement. That is why Emerson has introduced Operational Certainty™, a technology and engineering-based programme, designed to help manufacturers reach Top Quartile performance in the four key areas listed here above.

A fundamental strand of Operational Certainty includes delivering on the promise of the Industrial Internet of Things (IIoT) and enabling companies to implement IIoT applications that can help them achieve a significant return on their investment. In this edition of Innovations in Process Control we look at all aspects of Operational Certainty (pages 4 – 5), including how our expanded Plantweb digital ecosystem (pages 6 – 7) and Connected Services (pages 12 – 13) leverage IIoT to deliver significant operational performance improvements.

With its unparalleled network of sensor technologies (pages 8 – 9), scalable analytics software and Microsoft®-powered cloud services (pages 10 – 11), Plantweb has become the industry's most comprehensive IIoT portfolio. It enables companies looking to adopt IIoT to start small and then expand their IIoT applications later – there's no limit to how big your measurable business improvement could be.

Discover how Emerson can help your company improve its operational performance at **Emerson.com/IM102** or contact us today via **EmersonProcess.com/Europe**

Roel Van Doren
President Europe
Emerson Automation Solutions

Contents

Operational Certainty targets recovery of one trillion dollars

Roel Van Doren, President Europe, Emerson Automation Solutions, explains how Operational Certainty™, an innovative technology and engineering-based programme, provides a clear roadmap to help industrial companies achieve Top Quartile performance and recover more than $1 trillion in operational losses globally.

separate Top Quartile performers (defined as achieving operations and capital performance in the top 25% of peer companies) from those in the lower tiers. These include:

- Top Quartile performers had one-third the number of safety incidents compared to their average industry peers.
- Top Quartile performers spent half as much on maintenance compared to average performers and had an increased production availability of 15 days per year.
- Top Quartile manufacturers spent 20% less on production-related expenses compared to average producers.
- The top 25% of producers spent one-third of the industry average on energy costs and had 30% less CO_2 emissions.

Oil and gas, petrochemical, refining, life sciences and other manufacturing companies face ongoing pressures to achieve improved financial results. Enhancing the economic performance of existing production facilities can help them accomplish that goal. However, despite years of operations improvement programmes, the results have been disappointing for many thus far.

Because of limited peer benchmarking and uncertainty over which approaches will yield the greatest improvements, many companies in the industrial sector have become stuck in decades-old work practices that fail to take advantage of available advanced digital technologies. Their performance levels are suboptimal, and globally it is costing more than $1 trillion per year in operational losses.

The key to companies setting and achieving improved performance goals is first to understand what is possible based on today's available technologies and which levers can deliver measurable results. Working closely with leading benchmarking companies and our customers, Emerson has identified the behaviours and actions that

With a desire to help our customers to achieve Top Quartile performance, we have launched Operational Certainty, a technology and engineering-based programme designed to help recover that $1 trillion in operational losses.

A critical part of Operational Certainty is the use of new peer benchmarking insights to bring a better perspective on best practices and technologies to achieve Top Quartile performance in the areas of safety, reliability, production and energy management.

The path to Top Quartile performance starts with an Operational Certainty Workshop. These sessions help to pinpoint the root causes of poor performance, prioritise actions that can yield the greatest improvement and establish a scalable workplan for achieving those results.

Emerson has also launched a new Operational Certainty consulting practice, plus expanded project execution methodologies and resources. Additionally, Emerson has announced its new Plantweb digital ecosystem to provide the technology foundation for companies to securely implement the Industrial Internet of Things (IIoT) to achieve measurable business performance improvements.
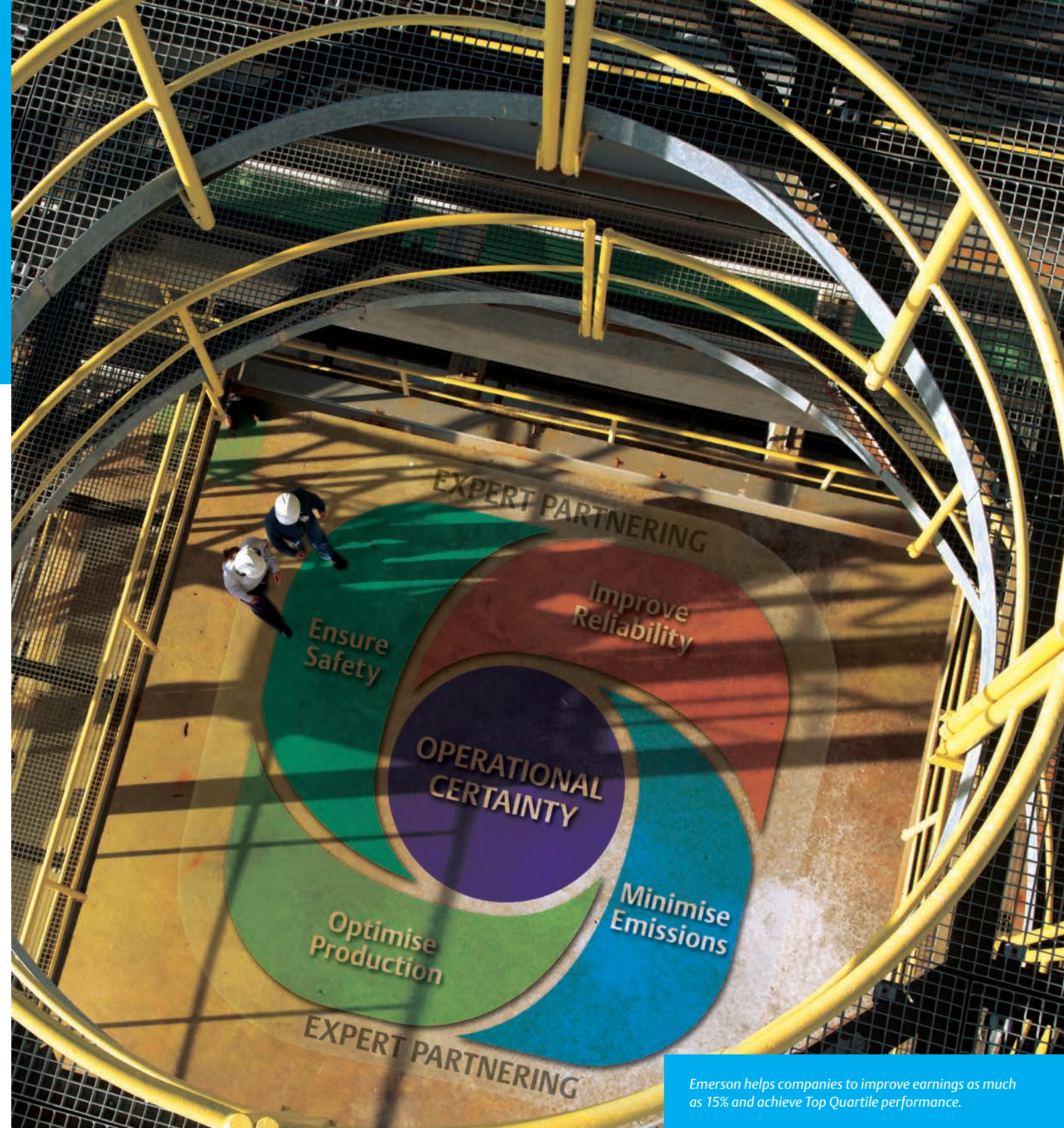
Emerson helps companies to improve earnings as much as 15% and achieve Top Quartile performance.

With customers hungry for new ideas and looking for proven ways to harness the power of IIoT to make technology work in measurable, meaningful ways, Operational Certainty can have a transformational impact on their performance.

Emerson knows precisely what behaviours are delivering industry-leading performance and what is required for other companies to reach those levels. With our industry expertise, consulting services, comprehensive automation technologies portfolio and new IIoT solutions, we can help customers leverage the best practices and strategies of Top Quartile performers, and improve their earnings by as much as 15%.

For more information on Emerson's Operational Certainty programme, visit Emerson.com/IM102

Plantweb digital ecosystem puts ROI into IIoT

We asked Peter Zornio, Chief Strategic Officer, Emerson Automation Solutions, about the potential of the Industrial Internet of Things (IIoT), and how Emerson's expanded Plantweb™ digital ecosystem is helping customers reap the benefits of IIoT and achieve a return on their investment.

Emerson's Operational Certainty programme aims to help industrial companies achieve Top Quartile performance. What role does the Industrial Internet of Things (IIoT) play in Operational Certainty?

Perhaps the biggest industry technology buzz we hear today is about IIoT. Distributing data and information seamlessly via the internet makes IIoT the new frontier of manufacturing - it has even been referred to as a phenomenon that will reinvent manufacturing. Clearly IIoT is an important part of the fourth industrial revolution we find ourselves in. IIoT is pivotal to Operational Certainty because Emerson can leverage the benefits of IIoT to help companies improve their operational performance.

How will investing in IIoT applications improve operational performance?

IIoT makes it possible to either empower your company's experts with the additional information they need for decisions and action that can facilitate operational performance improvements, or for the first time to completely outsource that analysis and decision making to third party domain experts. There are four critical aspects to achieving this: the provision of rich, real-time operating data from intelligent sensing and automation technologies across the business; secure transport of that data to where it's needed anywhere in the world; robust, scalable software to convert the data into actionable insights; and domain expertise to make the decisions and drive the outcomes that will lead to improved performance. A new business model called Connected Services has also emerged where those last two pieces are performed by a remote third party rather than in-house experts.

How is Emerson helping companies successfully implement IIoT applications to make Operational Certainty possible?

In 1997 Emerson revolutionised the automation landscape by launching Plantweb, the first field-based digital plant architecture. If you are using DeltaV™ or Ovation™ control systems, AMS asset management tools, Rosemount™ measurement devices and Fisher® valves, you already have the foundation of Plantweb. Now we have introduced the expanded Plantweb digital ecosystem, a scalable portfolio of standards-based hardware, software, intelligent devices and services for securely implementing IIoT with measurable business performance. Plantweb has become the industry's most comprehensive and integrated IIoT portfolio.

What does the new, expanded Plantweb provide or customers?

In addition to highly secure process control, safety and asset management systems from the original Plantweb, the Plantweb digital ecosystem now provides robust, real-time visibility from an expanded range of Pervasive Sensing™ field instruments; protection via the Secure First Mile™ family of software, gateways, security devices and services; applications including Plantweb Insight,™ Plantweb Advisor™ and the AMS ARES™ Platform that provide embedded domain expertise and connectivity across the enterprise; Microsoft-enabled Emerson Connected Services, offering secure, cloud-based access to experts and analytics for real-time asset monitoring and performance optimisation, with no-to-low capital investment. These things combine to provide a comprehensive framework to help achieve Top Quartile performance.
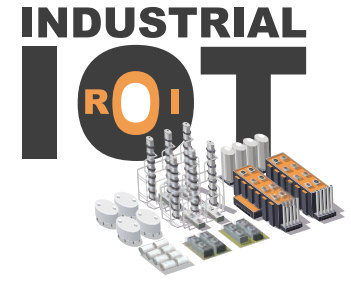
Can customers expand their use of Plantweb over time?

Absolutely. The scalability of these new applications allows you to start small, yet still have an immediate impact. Then, over time, you can keep expanding and get even greater results by introducing more integrated solutions across your whole operation.

Is IIoT's potential now being delivered?

I believe so. There has been so much talk about the promise of IIoT. Emerson is now delivering that promise with a compelling and clear business case in Operational Certainty and with the most robust, scalable technology and service platform with the Plantweb digital ecosystem. Emerson is now putting the ROI into IIoT.

Visit Emerson.com/IM103 for more information on Emerson's expanded Plantweb digital ecosystem.

Pervasive Sensing drives operational excellence

Danny Vandeput, Director Pervasive Sensing Strategies at Emerson Automation Solutions, describes how Emerson's Pervasive Sensing™ technologies are enabling plants to realise the full potential of the Industrial Internet of Things (IIoT) by providing the information necessary to drive operational excellence in safety, reliability, production, energy management and environmental compliance.

With the prolonged industrial downturn continuing, it is more important than ever for plants to operate as reliably and efficiently as possible. To achieve this, operators must be able to collate and view real-time process information from everywhere in the plant, enabling them to take the appropriate action that can lead to dramatic operational performance improvement.

There is a saying that knowledge is power, and the more you know about your plant, the better you can maintain it, the fewer 'unfortunate events' there will be, and the lower your costs will be. Today, given the increased availability and affordability of innovative sensors along with advances in wireless technology and analytic capabilities, the ability to gather plant-wide data has become much more widespread. The capture of this information is what Emerson calls Pervasive Sensing, and this forms part of its Plantweb digital ecosystem IIoT architecture, supporting its Operational Certainty programme.
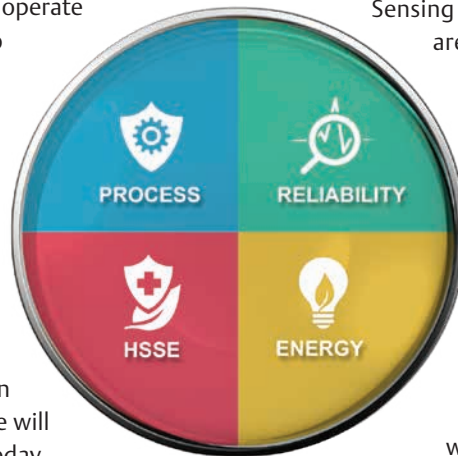
In manufacturing, Pervasive Sensing provides measurable and significant improvements in process and worker safety, regulatory compliance, equipment reliability and energy efficiency. It makes it possible to detect and respond to hazards early, protect people and equipment, predict failures, reduce shutdowns, and avoid environmental issues. Enhancing and adding sensor points to a plant's infrastructure enables improved understanding of operations without adding complexity, making it possible to optimise processes and therefore attain operational goals by increasing productivity and profitability.

Emerson's Pervasive Sensing strategies are expanding the use of sensor and analytics technology into new operational performance areas. They are doing this through a new generation of low-cost sensors that are easy to install and maintain, take advantage of wireless communications as part of a secure, integrated industrial network, and use new analytic algorithms to create insights into the performance of a plant's assets.

Emerson's broad and expanding portfolio of Pervasive Sensing technologies includes capabilities in the areas of hazardous gas sensing, wireless corrosion monitoring, wireless medium voltage equipment monitoring, wireless gas monitoring, wireless non-intrusive surface-sensing temperature measurement, wireless power metering and pressure gauge measurement.

Emerson's Permasense Wireless Corrosion Monitoring, for example, is a permanently-installed solution that uses unique sensor technology, wireless data delivery and advanced analytics to continuously monitor for metal loss from corrosion or erosion in pipes, pipelines or vessels.

Designed to operate without maintenance for years, this monitoring technology reliably delivers high-integrity data in even the harshest environments, providing ongoing visibility of corrosion and erosion trends in real-time and direct to the engineer.

Pervasive Sensing enables plants to realise the full potential of Industrial IoT.

Central to these corrosion-monitoring systems are sensors that employ proven ultrasonic wall thickness measurement principles. These sensors are battery-powered and communicate wirelessly, which minimises the cost of installation and enables use in remote areas and on a large scale. The sensors are also designed so they can be deployed in hazardous and remote areas.

Furthermore, the analytic software accurately forecasts corrosion and erosion issues/locations in pipelines or vessels, allowing operations to run at peak performance while keeping integrity in focus. The entire system can be configured for integration with virtually any existing IT architecture, enabling quick and easy deployment.

Visit Emerson.com/IM104 for more information on Emerson's Pervasive Sensing strategies.

Plantweb digital ecosystem integrates Microsoft IoT technology to provide expert Connected Services.

# Joining forces with Microsoft to provide cloud-based IIoT services

Travis Hesketh, Vice President Marketing, Emerson Europe, reveals how Emerson is working with Microsoft to power its Industrial Internet of Things (IIoT) applications, as part of its Operational Certainty programme, helping industrial manufacturers make the business improvements that will lead them to achieving Top Quartile performance.

The challenge industrial manufacturers face when implementing Industrial Internet of Things (IIoT) applications in their plants is ensuring that these changes will help them achieve measurable business improvement and consequently increase their bottom line. Emerson believes that its Operational Certainty programme will not only help them achieve those aims, but also improve their chances of attaining Top Quartile performance.

Emerson's expanded Plantweb digital ecosystem and Connected Services, offering secure, cloud-based access to experts and analytics for real-time asset monitoring and performance optimisation, enables these benefits to be delivered by providing the most comprehensive IIoT platform in the industry.
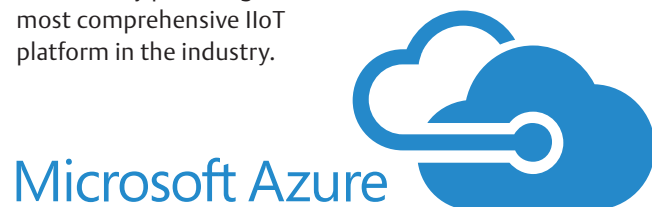
At our 2016 Global Users Exchange in Austin, Texas, USA, Emerson announced that we have standardised on the cloud-based Microsoft Azure IoT Suite to enable Connected Services, expanding Plantweb to provide a secure, flexible platform for private cloud networks and third-party cloud service relationships.

The Azure IoT Suite is a scalable and secure cloud application environment which offers a broad range of capabilities that help industrial manufacturers to confidently adopt IIoT. The Azure IoT hub already processes billions of messages every week, resulting in the generation of intelligent insights, enabling companies to implement the actions that will lead to significant business performance improvement.

Emerson's partnership with Microsoft creates IIoT services that can improve customers' overall operational performance and efficiency. Extending a more than two-decade relationship between the companies, Emerson is also broadly adopting Microsoft's Windows 10 IoT technology, both in our DeltaV and Ovation control systems and in data gateways, for local data processing and to serve data to the Azure IoT Suite.

To power its IIoT applications, Emerson chose Microsoft for its comprehensive offerings that span both the intelligent edge, with Windows, and the intelligent cloud, with Azure. These capabilities should ultimately remove the need for in-house domain experts, as Emerson will provide the real-time monitoring of infrastructure that manufacturers require.

Both the Azure IoT Suite and Windows 10 IoT have a proven record of success in industrial applications. By integrating these Microsoft offerings, Emerson can expand Plantweb to cloud applications that can also be delivered in a turnkey 'connected service' model for the entire enterprise.

The combination of Emerson application expertise hosted on Microsoft Azure, will provide a compelling suite of IIoT applications to expand digital intelligence to the entire manufacturing enterprise. These applications will be easily and quickly deployable and have immediate quantifiable business benefits for industrial manufacturers looking for better operational performance.

Visit Emerson.com/IM105 to discover more about how Emerson's cloud-based IIoT solutions can help increase your bottom line.

Microsoft Azure

Microsoft

Cloud-based technologies enable remote Emerson experts to continuously monitor plant assets and processes.

Cloud-based Connected Services optimises plant performance

Xavier Marchant, Vice President Process Systems & Solutions Europe, Emerson Automation Solutions, explains how cloud-based technologies are enabling Emerson experts to remotely monitor critical plant assets and processes, and generate actionable data to improve reliability and operational performance.

The implementation of the Industrial Internet of Things (IIoT) is enabling plants to generate unprecedented amounts of data from their assets and processes. But such information must not only be gathered but also analysed, so plants then face the challenge of making sense of all this data, to drive business performance improvement.

It's costly to develop dedicated experts who solely focus on value-added analysis – and tough to retain them. As technology continues to expand, the result is a widening gap between a technology's capability and a plant's ability to fully realise that capability.

Emerson is bridging that gap with its Connected Services offering, a key component of its Plantweb digital ecosystem portfolio that aims to help companies achieve Top Quartile performance. Connected Services harnesses IIoT to offer remote, continuous assessment of a plant's critical equipment and processes by Emerson experts to deliver the actionable performance insights customers need to improve efficiency and avoid costly unplanned downtime.

Connected Services utilises Microsoft Azure cloud services and data analytic tools that provide a scalable and secure cloud application environment. It offers customers support across four main subscription-based service offerings, including:

Control Valve Connected Services – Emerson make use of the tools and smart technology already existing in many industrial facilities to offer a continuous health monitoring service for control valves, that delivers predictive analysis. The service analyses a wide variety of diagnostic data collected from digital valve controllers, to identify potential control valve failures before they cause significant interruptions to operations. Preventing such unscheduled downtime can save customers millions of pounds.

Steam Trap Connected Services – Steam trap leaks can account for 10% of a plant's energy costs, so steam trap health monitoring can produce significant savings. Emerson uses wireless acoustic transmitters to remotely monitor steam traps, even in hard-to-reach locations. The state of each steam trap and its monitoring device is communicated wirelessly to a central database where maintenance personnel can effectively plan and prioritise work. Up-to-the-minute visibility of all steam traps allows manual rounds to be eliminated and energy waste to be dramatically reduced.

DeltaV System Health Connected Services – DeltaV system health monitoring provides continuous health scanning of a plant's integrated control system, from controllers and servers, to switches and network components. The service identifies intermittent issues

and underlying health warnings, which could result in costly unplanned downtime if not proactively mitigated. It also eliminates manual health checks, enabling effective use of maintenance resources. The benefits of this include improved asset availability, reduced maintenance costs and improved personnel efficiency.
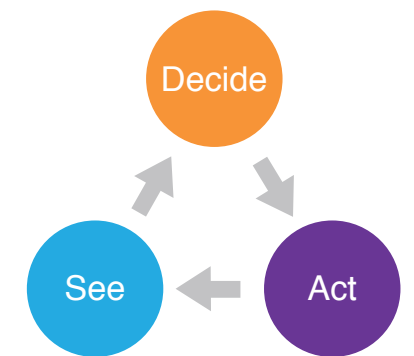
Machinery Connected Services – Utilising a network of global expertise, Machinery Connected Services improves the health and reliability of a plant's key rotating equipment, such as blowers, pumps and fans. The service uses advanced hand-held or on-line analysers to collect data that is then analysed by a team of Emerson experts who determine potential degradation problems and optimal efficiency. With this condition monitoring service, customers can detect problems in their rotating equipment early, improve the equipment's availability, and reduce operations and maintenance costs.

Visit Emerson.com/IM101 to discover more about how Emerson's Connected Services offerings can help you improve your business performance.

Innovative
technologies

Secure First Mile overcomes IIoT security challenges

The Industrial Internet of Things (IIoT) presents opportunities for maximising operational performance through unparalleled levels of connectivity. However, increased connectivity brings greater risk, especially within the 'first mile', where data is moved from the plant floor onto the internet. Without robust security technologies in place, a plant's assets can be exposed to harmful agents that can cripple operations.

Emerson's Secure First Mile™ is a set of architectural approaches and designs, enabled by a family of security services and robust, secure and flexible servers, gateways and data diodes. It ensures that data in existing operational technology (OT) can be easily and securely connected to internet-based applications. Using Secure First Mile architectures, a plant can transform its OT data into information technology data without exposing its systems to harm.

Secure First Mile architectures provide support for IIoT-enabled devices as well as legacy devices and systems.

These architectures leverage Emerson's existing systems and data collectors, including distributed control systems such as DeltaV and Ovation™, remote terminal units, and asset management software such as the AMS Suite. Secure First Mile architectures create secure, direct data export paths from these products and systems to the internet and enable plant personnel to exert tight control over the data that is exported.

Emerson also offer cyber security consulting services to deploy Secure First Mile architectures. Emerson security consultants work with customers to evaluate existing infrastructure and define the most secure solution. Together, these technologies and services bridge the gap between the plant floor and the cloud by enabling secure data collection and aggregation, control over data flow, and the highest standards for encryption and authentication.

Visit Emerson.com/IM111 to learn more about Emerson's Secure First Mile.

Instant data interpretation improves safety, reliability and efficiency

Modern sensing technology provides workers with more data than ever before. However, to deliver improvements to safety, reliability and efficiency that will help plants become Top Quartile performers, they need to be able to instantly interpret this glut of information.

Emerson's Plantweb Insight is a web-based platform that facilitates such improvements by interpreting critical data through a scalable suite of applications. It enables users to identify abnormal situations and inefficiencies, recognise optimum maintenance times and track asset health to identify and prevent failures, before they occur.

Its user-friendly, intuitive interface is very easy to install, with pre-built analytics requiring minimal configuration, and it can run on any device with access to a web browser.

More than a dozen applications are scheduled for release. The first three – for monitoring steam traps, pumps and pressure gauges – are available now. Future Insight

applications will focus on heat exchangers, asset location, corrosion, electrical equipment, hydrocarbon leaks, mass flow, power modules, pressure relief devices, safety showers and wireless networks.

Visit Emerson.com/IM107 to learn more about how Emerson's Plantweb Insight applications can help you deliver operational improvements.

Access critical data wherever you are

Empowering today's industrial workforce involves solving the challenge of making sure that the right data reaches the right experts, regardless of where they are. To monitor asset health and improve maintenance efficiency and plant safety, from wherever they work, Emerson's Always Mobile portfolio, part of its Plantweb digital ecosystem, provides workers with the applications, tools and digital intelligence they need.

Always Mobile solutions deliver secure, instant access to critical information in intuitive views that prepare personnel to make business-critical decisions more effectively. The portfolio includes:

AMS Asset View – This connects into the AMS ARES Platform, enabling asset health information to be presented on desktops, laptops and mobile devices. Its persona-based views ensure that reliability personnel know the health of their assets in relevant time and always see the alerts they need to see - and only the alerts they need to see – so they can focus on asset conditions critical to production.

DeltaV Mobile – This allows process engineers, operators, and plant managers to quickly and easily view personalised watch lists and receive real-time alarm notifications. DeltaV distributed control system users can remotely monitor their process and have plant data at their fingertips, whenever they need it.

Guardian™ Mobile – This delivers visibility of critical data for control, asset, machinery, and device monitoring systems. The application is expected to be available for release to mobile app stores in early 2017.

AMS Trex Device Communicator – This is a powerful hand-held communicator for advanced diagnostics, configuration, and troubleshooting in the field, designed to improve the efficiency of tasks performed by maintenance technicians.

Visit Emerson.com/IM108 to discover more about how Emerson's Always Mobile portfolio can deliver your data to the right people.

Gain a return on investment from the IIoT using the Plantweb digital ecosystem: Emerson.com/Plantweb

Discover how you can achieve Top Quartile Performance: EmersonTopQuartile.com

Subscribe to Emerson's latest product news, event invitations and quarterly newsletter: Emrsn.co/Subscribe

Further information