OCTAVE

eBook

Chemicals of tomorrow: Optimizing operations with digital transformation

Octave's solutions can help your chemical operations prepare for tomorrow, today!



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Introduction

Many of today's chemical companies are exploring how to embrace the world of tomorrow by focusing their energy on the management of change to address key cybersecurity, operations and safety issues in the industry.

The operations and maintenance teams are the people we rely on to operate and maintain assets and infrastructure that keep chemical plants and facilities running smoothly. Often these critical employees are forced to use inefficient paper-based reports and spreadsheets to manage key industrial processes such as control of work, inspections, maintenance, management of change, operator rounds, shift handover, troubleshooting and capturing operator shift logs while also juggling large amounts of unstructured data such as engineering documents and schematics that are critical to ensuring safe operations at facilities. And, given the move to remote work and the inherent difficulties updating and revising paper-based assets, this information may also be outdated, inaccurate or inaccessible. It's not as easy to head into the office or physically access remote locations to look for scattered paper copies.

These information and process management problems can and often do create safety risks. Octave studied 101 industrial accidents that occurred between 1983 and 2018 and found poor human procedures were a contributory factor. These industrial accidents killed 405 people and injured 2,163 others. This is a reminder on the importance of human factors and process safety. Inadequate information management processes increase operational risk, as personnel often don't have quick access to all the information they need when safety-critical events occur.

If a facility has been operating for years with no issues, it's tempting to continue the status quo, especially in a challenging economic climate. However, there are also negative financial impacts when industrial accidents occur, such as fines from regulators, an increase in insurance premiums and a decrease in stock price. An investment in an asset lifecycle information management (ALIM) strategy is an investment in the long-term health of your personnel, your assets and your bottom line. The following are just three incidents at chemical facilities that highlight the importance of informed workers as a critical part of the layers of protection that help keep plant operations safe.

According to Deloitte (2019), growth and innovation, performance and cost optimization and sustainability and the circular economy are the three strategic pillars that chemical companies can leverage to reach to their full potential in the future. It is also an important trend in the chemicals industry. There is a clear convergence between all of these and digital transformation. Sustainable operations where repair is done rather than replacement and reuse is maximized require greater and more detailed facility information. Worker empowerment and performance on the plant floor is also dependent on easier access to large amounts data. A proactive digital transformation strategy also helps to attract and retain new talent to the chemical manufacturing industry. The Resonac (formerly Showa Denko) Oita Complex also reduced the degradation of experience and knowledge due to rapid generation change by providing an advanced business operations and technology transfer to young staff.

Williams Olefin plant explosion and fire

Prior to manipulating hazardous valves in the field, Williams did not conduct a hazard analysis and develop written procedures for personnel.

Fatalities: **2**

Injuries: **167**

Reported financial costs (USD)

$34,028,957.32

(legal costs and OSHA fines)

DuPont LaPorte facility toxic chemical release

A series of shift communication mistakes that began five days before the incident and eventually led to the release of nearly 24,000 pounds of methyl mercaptan, a toxic chemical.

Fatalities: **4**

Injuries: **1**

Reported financial costs (USD)

$3,373,000.00

(EPA and OSHA fines)

Haverhill Chemicals reactor drain fatal chemical exposure

The company failed to develop procedures for the normal and emergency shutdown of the bisphenol A reactor and didn't develop written procedures to maintain equipment used to process chemicals during maintenance.

Fatalities: **1**

Injuries: **17**

Reported financial costs (USD)

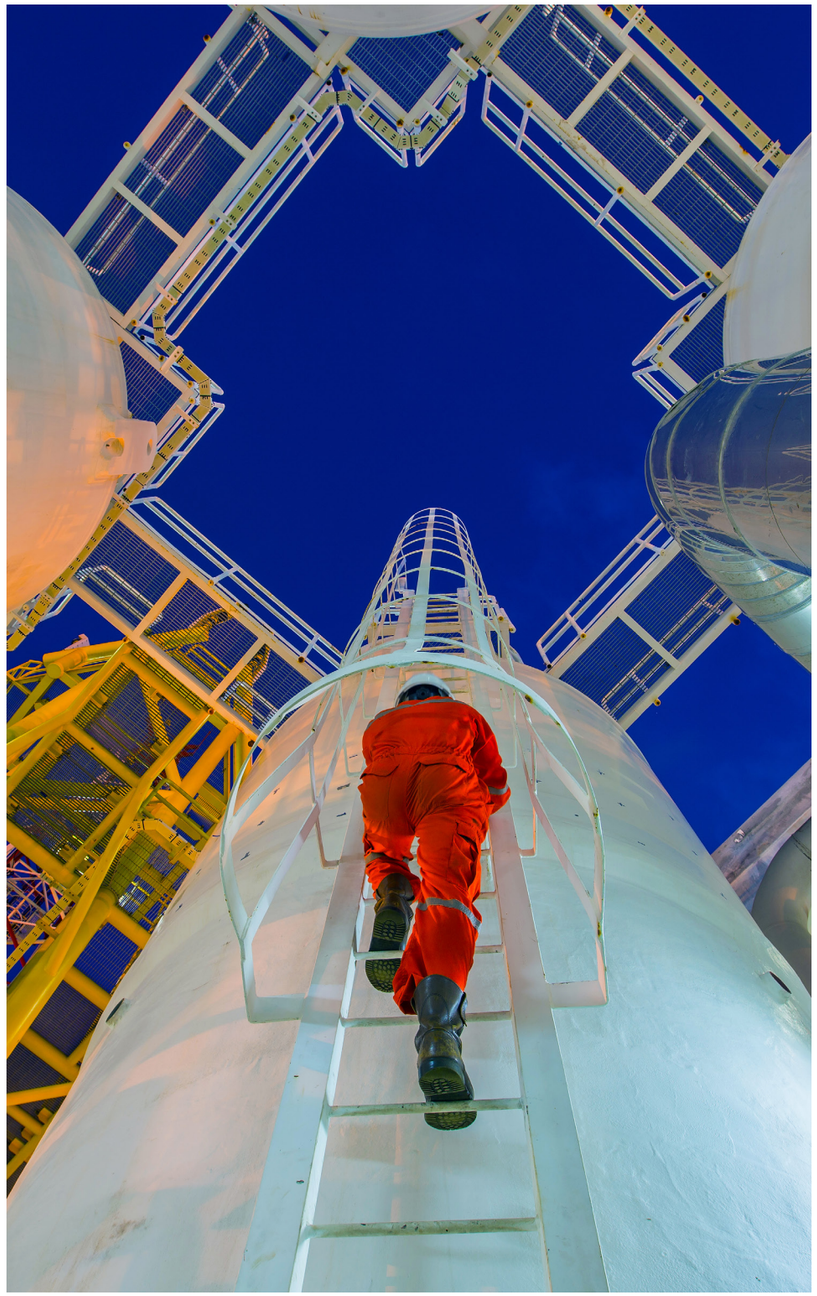
$134,000.00

(OSHA fines)

Octave can help your chemicals organization prepare for the “next normal” in cybersecurity, operations and safety management. Whether you need to digitalize and transform operational systems and processes, accelerate your continuous improvement initiatives, improve decision-making, maximize leadership time in the field, drive compliance to processes, optimize alarm management, protect your digital investments with state-of-the-art cybersecurity or build out a comprehensive digital twin, we are here to support your digital transformation journey and prepare for tomorrow, today. In today’s digital age, where technology is being embraced at an exponential rate, personnel at many chemical facilities are still using hard-copy documents, siloed spreadsheets, scattered databases and other inadequate data collection and management tools for crucial day-to-day procedures such as shift handover. This can lead to miscommunication, mistakes, inefficiencies and major operational and safety risks, all of which can be avoided. Some of the common challenges faced by chemical operators include:

- Deficient mobile technology and/or applications.
- Detached real-time and process data from data historians, the CMMS, the DCS, EAM, PLC and SCADA systems.
- Double handling of data.
- Inadequate schedule compliance or compliance plan performance.
- Insufficient leverage of the information collected in business value decision making.
- Limited, singular add-on tools or point solutions that are costly and often incompatible with each other.
- Missed opportunities to collect, store and structure more situational, qualitative and quantitative information.
- Multiple data-entry systems for operations and HSE personnel.
- Siloed information that’s inaccessible to employees across the operation.
- Slow and expensive methods for making changes that impede operational continuous improvement efforts.
- Sluggish uptake of multiple systems for new employees.

Based on our own internal expertise and listening to our customers share their experiences, we have identified three principal business reasons why a chemical organization should accelerate its digital transformation journey (employee safety and fatality prevention, workforce productivity and asset productivity).



Customer spotlight

Infineum is a world leader in the formulation and manufacturing of petroleum additives for lubricants and fuels. The company draws on nearly 80 years of innovation and has manufacturing plants in Brazil, China, France, Germany, Italy, Singapore and the USA.



Photo: Infineum Manufacturing Plant in Vado Ligure, Italy

Customer challenges

As part of the company's commitment to global manufacturing excellence, Infineum required a solution that would standardize shift handover processes and reporting across the whole group. Infineum also needed a solution that would ensure consistency while accommodating the diversity of different sites, units and languages etc. Data needed to be brought together from a variety of sources and a standardized daily production meeting report for each site was required. Infineum's overall goal was to improve reliability, accuracy and communication effectiveness, while simplifying routine operator tasks and the preparation of shift reports.

Octave solution

As a result of implementing Octave Tempo Operations Management (formerly j5 Operations Management Solutions), information is now available to all members of the operations team and beyond, leading to enhanced communication flow, time savings and increased accuracy. By harnessing the right information quickly, a formalized Tempo Shift Handover (formerly j5 Shift Handover) process is contributing to improved decision-making which helps reduce operational risk. The benefits of Tempo Operations Management to Infineum include:

- Time is saved and accuracy is increased by automatically producing vital daily reports that were previously collated manually, reducing overall manual data capture.
- Information is available to all members of the operations team and beyond, resulting in improved communication within shift teams, across shifts and with management.
- Tempo Operations Management is contributing to improved decision-making by harnessing the correct information as soon as it becomes available.
- The formalized Tempo Shift Handover process ensures that a consistent procedure is followed, reducing the risk of accidents.
- The flexibility of Tempo Operations Management is enabling the group to harmonize its approach to shift handover and daily production meetings, despite the diversity of its manufacturing plants.
- Tempo Shift Handover reports help Infineum meet its regulatory and compliance obligations.

Accelerate your digital transformation journey to operational excellence with Octave

Investing in a comprehensive, interoperable and enterprise-scalable digital transformation strategy will accelerate your continuous improvement efforts in this ever-changing economic landscape. It will also promote the long-term resilience of your company's safety performance, workforce and asset productivity and provides your business with the competitive edge it needs to perform at its best. As your trusted digital transformation partner, Octave's operations and maintenance solutions can help you create intelligent information from disparate sources including unstructured disconnected data, documentation and structured digital data sources and existing databases. Octave's solutions also help you find and resolve duplicate data and consolidate information to reduce operational risk, increase efficiency, decrease downtime, remove value leaks and meet internal and external compliance. Here is how we can work with you to implement your operational excellence digital transformation roadmap, step-by-step.

Step 1

Digitalize operational processes, procedures and permits

The creation of a solid operations management data ecosystem by digitalizing your operational processes, procedures and permits is a strong first step on the road to digital transformation. Critical asset, situational, qualitative and quantitative information should be captured, structured and stored digitally and more importantly, organized and made available to support safety-critical operational processes.

Tempo Operations Management can take your shift, operator rounds, personnel, safety, maintenance and process information and make it visible and viable to users across the entire organization. This on-premise, or SaaS, solution is designed to foster greater communication, coordination, transparency and knowledge transfer between teams that in turn leads to improved safety and productivity, reduced operational risk and a more empowered and engaged workforce. Tempo Operations Management offers a unique, straightforward digitalization approach with its patented spreadsheet-like configuration environment. This distinctive yet familiar low-code/no-code approach enables personnel to quickly manage changes without requiring expensive and slow vendor and IT services, accelerating operational continuous improvement so your information collection and sharing is always up to date and reflective of your operations. This distinction allows Tempo Operations Management to be a quick-time-to-value investment, with high flexibility and a lower total cost of ownership.

Reinforcing this first step with an industry-leading knowledge management suite aimed at making human performance better through digital tools and connection to the modern process industry solutions used today is critical.

Octave Tempo Operating Procedures (formerly AcceleratorKMS) is an industry-leading solution that expedites the digital transformation of paper-based, high-risk operational procedures and work processes. However, it also enables organizations to easily manage, govern and distribute the up-to-date critical operational content field workers require to keep operations running optimally and learn faster. Tempo Operating Procedures is a purpose-built and industry-leading knowledge management system for critical operational content. The digital system includes Procedure Lifecycle Management (PLCM), a Connected Worker Platform (CWP), a Learner Experience Platform (LXP) and a Component Content Management System (CCMS). The combined capability facilitates solutions to many critical problems experienced in workplaces across America and around the world. The system provides an integrated digital content ecosystem in an easy-to-use and intuitive package focused on making the complex simple.

“The implementation of Tempo Operations Management across the water control function has given greater visibility of ongoing issues and given us a consistent and accountable shift handover tool.”

Ant Tyler
Systems Operations Compliance Manager, Thames Water, U.K.

Proven business outcomes

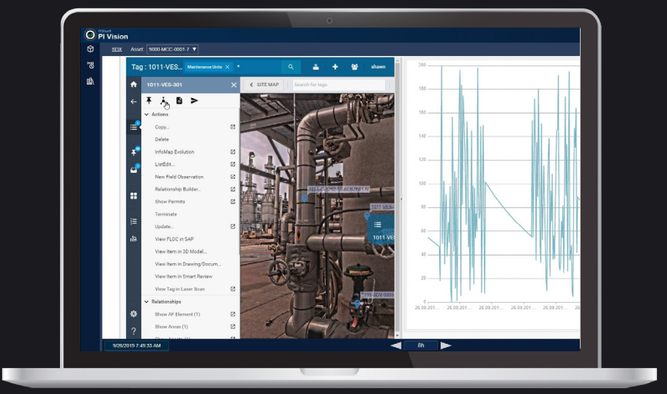
These are quantitative benefits that were reported by surveyed Tempo Operations Management customers in 2020:

- Enhanced situation awareness **(30%-50%)**
- More accurate shift handovers **(30%-50%)**
- Increased asset availability **(20%-50%)**
- Better workforce productivity **(20%-50%)**
- Improved regulatory compliance **(20%-50%)**
- Reduced maintenance costs **(10%-50%)**

Step 2

Connect operational data

Next, organizations must bridge the islands of crucial information and records in numerous formats on separate systems and digitally connect them to operational processes, procedures, permits and data to help reduce operational risk, increase efficiency, decrease downtime, remove value leaks and meet internal and external compliance. With Octave Tempo Alarm Management (formerly PAS AlarmManagement) you can easily implement industry-wide best practices to streamline and improve your alarm systems and operator effectiveness. Octave Tempo Control Loop Performance (formerly PAS ControlWizard) works to monitor, assess and tune your control loops to ensure optimal performance, robust control and improve overall safety and reliability. Octave Tempo Boundary Analytics (formerly PAS InBound) helps you create a master database of operational limits. With it, you can ensure alignment across all your sources of record and analyze your performance against those limits. Octave Tempo Safety System Performance (formerly PAS IPL Assurance) provides visibility into your independent protection layers (IPL), making it easier to assure your operations are safe to run. Octave Tempo Control System Effectiveness(formerly PAS PlantState Integrity) platform solution portfolio is interoperable with Tempo Operations Management. Adding further value to organizations investing in a digital transformation roadmap guided by Octave. Companies can further enhance information connection and interoperability by aggregating operational data and enabling a digital thread framework with Octave InConcert (formerly HxGN SDx2). This centralized, digital information solution is strategically designed to capture, organize and link large volumes of information, in context and provides web-based access to your authorized personnel. As a cloud-native, SaaS solution, it can be adopted by any facility without introducing new software or investments in IT infrastructure. InConcert is CFIHOS-compliant and consolidates and unifies operations maintenance, safety, engineering and real-time data. InConcert can be connected to other Octave solutions such as Tempo Operations Management and third-party industrial data sources such as Aspen InfoPlus.21®, IBM Maximo®, SAP® Plant Maintenance (PM) and the Aveva™ PI System™ to provide a consolidated, role and context-relevant view of information.



"To me it's completely game-changing to have all this information readily available on one screen. This is the first time an end user can go to one place and get all the operations, maintenance, engineering and process data they need to do their duties. By having all this information readily available in a digital twin, I believe this is an industry first for the oil and gas industry, where it has been difficult to monitor remote assets and equipment in dangerous areas."

President and CEO
Oil and Gas company (USA)

Proven business outcomes

Contact Energy (New Zealand)
60% alarm rate improvements by adjusting alarm setpoints, deadbands, delay times and improving control logic and **65%** reduction in long-standing "stale" alarms, contributing to improvement of operators' alarm-related workload

Oil & Gas company (USA)
70% productivity savings in documentation and completion of inspections and **95%** saving in time retrieving and searching for quality evidence post inspection

Step 3

Protect your digital investments

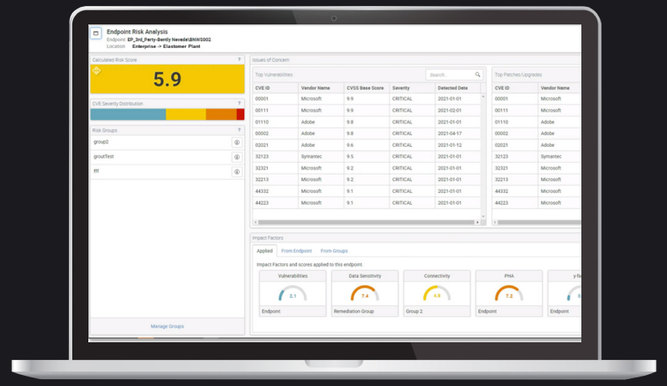
On the journey to digital maturity, keeping your operations running safely, smoothly and protected from cyber threats is vital to prevent unnecessary interruption to your enterprise. There is no shortage of reports or news outlets raising the alarm on cybersecurity awareness. The ARC Advisory Group (2019) reported that "many industrial operations remain at risk of costly, disruptive cyber incidents." Its analysts recommended that "all industrial companies consider software like Octave Cyber Integrity (formerly PAS Cyber Integrity) as a foundational element of a defense-in-depth cybersecurity strategy." This solution also provides numerous significant customer benefits such as: discovering and automatically maintaining a complete inventory of OT assets inventory and enabling workflows and documentation for vulnerability remediations and compliance with ISA/IEC 62443, ISO 27001/2, NERC-CIP, NIST and the NIS Directive, as well as other standards and regulations, accelerating recovery with backups of critical control system data and supporting in-depth forensic analysis. ARC Advisory Group also noted that the solution's capabilities support the execution of critical tasks in the "Secure Systems" and "Incident Management" processes identified in its "Industrial/OT Cybersecurity Maturity Model." This includes functionality for developing and maintaining asset inventories, identifying, evaluating and managing system vulnerabilities, detecting and managing unexpected system changes and analyzing and visualizing system security risks.

Proven business outcomes

- **Capture a holistic view of your asset inventory** to gain visibility into industrial assets from Purdue Level 3.5 to 0.
- **View risk in context -** identify, evaluate and prioritize OT cybersecurity risk across multiple domains.
- **Decrease mean time to recovery** to ensure operational resiliency by having a complete backup and restore point.

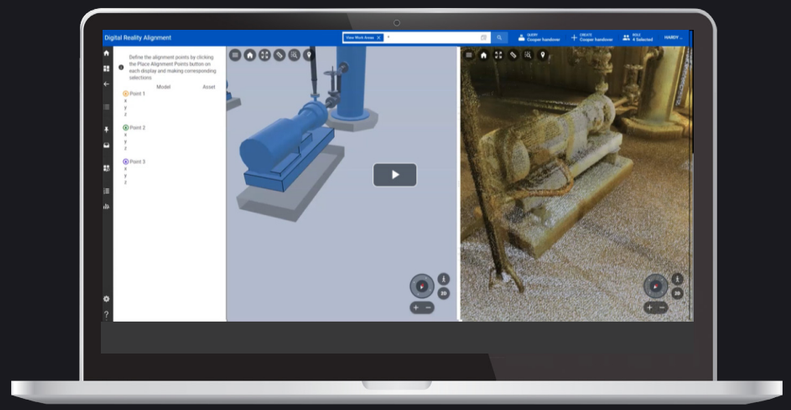
"In industrial facilities, you typically find an array of proprietary ICS that are difficult to inventory, which subsequently makes monitoring for change and vulnerabilities a security challenge. As these systems have direct authority over process safety and production, there is unaddressed cybersecurity risk within a facility environment. Octave has architected its software to cover these systems and its customers have testified to Octave's effectiveness in reducing security risk."

Vikrant Gandhi
Industry Director, Frost & Sullivan, USA



End goal

Build, maintain and evolve a digital twin



A digital twin enables asset owners and operators to build and maintain an information management data ecosystem throughout the asset lifecycle, allowing for a continuous journey of operational excellence. By deploying a comprehensive digital twin, complex data can be analyzed and transformed into actionable information. The significance of this ultimate digital platform is that it opens the door to the competitive advantages made possible by using predictive and prescriptive analytics, artificial intelligence (AI), machine learning and automated decision-making across the value chain. Boost your operations and empower your workforce by delivering a valuable, data-driven experience that encapsulates easily consumable, timely information regarding the past, the present and the future predictions to achieve situation awareness. Powered by Octave Alto (formerly Luciad), situation awareness allows you to connect your safety-critical operations, processes, procedures and permits, alarm management methodology, maintenance work orders, real-time and historical process data, engineering schematics and technical documentation with 3D models, laser scans and cybersecurity safeguards enabling a robust and comprehensive digital twin for your entire operation.

"Using the Octave technology, we built a 3D model of our plant that's so up-to-date, no one else has the equivalent in our industry. That's a definite competitive advantage, that somebody sitting at their desk can pull out engineering information instantly in a 3D visualization."

Alan Keith Chan
Controls, Information Management and Automation Manager, CNRL, Canada

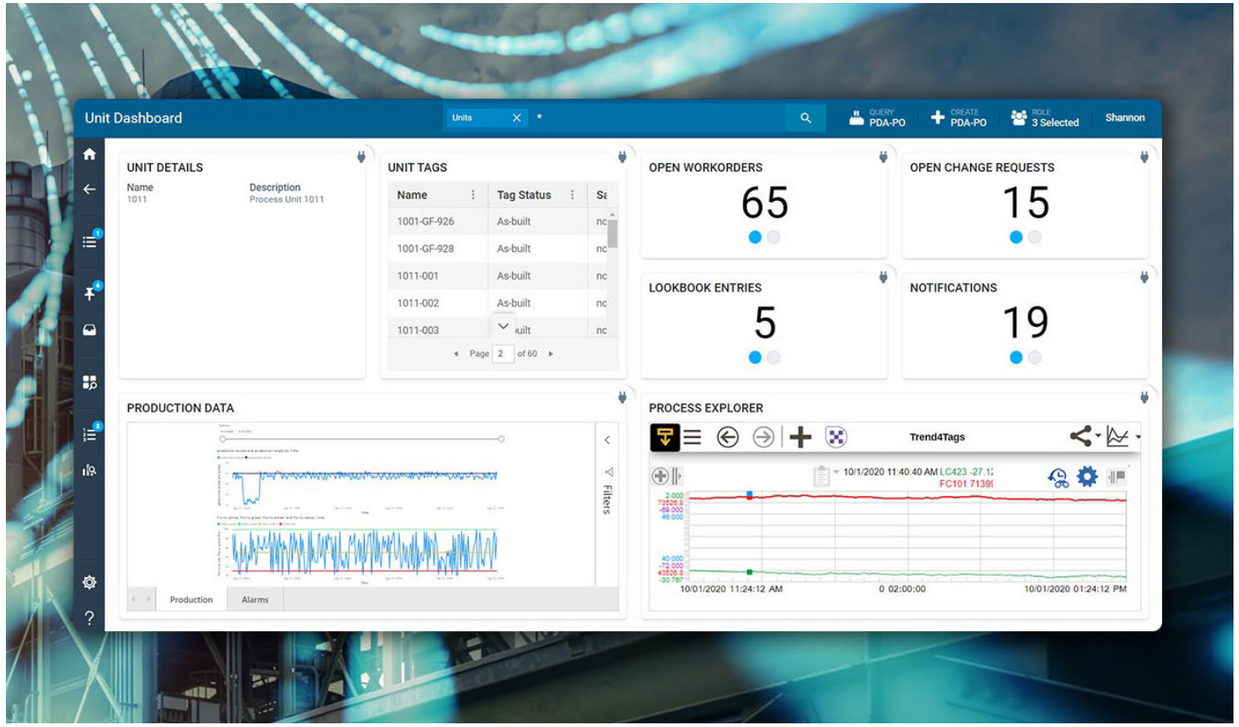
About InConcert

InConcert is Octave's next-level, cloud-native, SaaS solution for excellence in engineering and operations. Representing a significant update to InConcert Core (formerly HxGN SDx), InConcert is now the heart of engineering information management. InConcert is always on, intuitively simple, completely connected, infinitely scalable and innately intelligent.

Enriching asset lifecycle work processes, InConcert advances a best-in-class collection of core capabilities by seamlessly connecting to our powerful digital backbone. It unites critical data to form a digital thread that drives transparency, efficiency, productivity and informed decision-making while reducing risk and costs.

InConcert's core capabilities include:

- Asset lifecycle data and information management
- Document management and document control
- Design review and issue management
- Engineering change management
- Work packaging
- Asset modelling and visualization



Beyond traditional digital twins, InConcert and its powerful integrations give key stakeholders real-time access to the contextual data flowing across the asset lifecycle. By reimagining "business as usual," InConcert is a positive, disruptive force that eliminates unnecessary work cycles and processes.

Furthermore, InConcert is regularly and seamlessly updated to extend to more digital, dynamic and datacentric work processes, ensuring all stakeholders can unlock unprecedented value within industrial facilities, capital projects, asset fleets and entire organizations. This collaborative effort is a transformation journey to reimagine the future of asset management and operational excellence.

Achieve operational excellence in chemical manufacturing

Employee safety and fatality prevention: Risk mitigation and workforce accountability

Digitalizing and automating operational processes such as area and shift handovers, permitting and inspections enables an additional level of situation data to be collected and insights into workforce compliance and efficiency. These new insights help close operational gaps that create safety risks and help improve your operations to save time and money.

Workforce productivity: Decrease operating expenses (OpEx)

Optimized assets, reduced downtime, enhanced productivity and better safety compliance all contribute to lower OpEx and higher profitability. Technology is now allowing a larger percentage of the operational workforce to work remotely, which has been shown to increase employee engagement and happiness while reducing hazard exposure hours.

Asset productivity: Increase efficiency

Empower your workforce to make informed decisions in real-time with the information they need, when they need it and where they need it via desktop, laptop or mobile devices. With digitalized processes, the information you need is always on hand, there's no need to search for paperwork from a previous shift or interrupt a co-worker who's on break or vacation.



Employee safety and fatality prevention: Meet compliance

When you need clear, concise and current records for local, state or federal regulatory compliance requests and procedures, having your data locked in a physical paper trail can lead to unnecessary delays and misinformation. Digital records allow you to instantaneously deliver accurate, current and complete information to internal and external regulators.

Workforce productivity: Save time

From the office to the field, personnel can save hours each day with digital access to the right information at the right time. Instead of spending precious time sorting through paper documents or multiple systems to track, access and manage vital operational information, your personnel can put your data and their skills to work optimizing and improving operations.

Asset productivity: Reduce operational risk

Workforce safety is improved when you reduce the chances of human error due to reliance on physical paper, especially when it comes to equipment inspections and shift handovers. Digitalizing these processes ensures the right equipment and readings are inspected at the right time and assists employees in quickly highlighting when equipment is operating out of its specified ranges.

Introducing R-evolution

In February 2021, Octave launched a new business venture, R-evolution, to further develop its sustainability agenda, which includes climate goals to significantly reduce its own carbon footprint. R-evolution will invest in and run profit-driven, sustainable projects that leverage Octave's technology to accelerate the world's transition to a sustainable economy. The first set of investments, centered around renewable energy, will involve the construction and operation of solar farms in Andalusia, Spain, producing energy with 50,000 tonnes less CO2 equivalents per annum than the grid's residual mix.





Octave offers more than just software. We're there to support you every step along the way of your digital transformation journey with industry leading expertise and an arsenal of services to help you launch initial system deployments in days, adapt industry standards and best practices into your deployments, swiftly resolve complex issues in your core operations such as too many alarms and poorly designed displays. Together software, expertise and services from Octave help you modernize and simplify your operations, better support your operators and provide actionable information everywhere it's needed to meet your business goals while ensuring reliable and compliant operations.

Working with a trusted digital transformation partner

As **YOUR** trusted digital transformation partner, we provide evolving solutions that allow people to design, engineer, construct, operate and maintain industrial assets with state-of-the-art technology backed by a team of global experts and research. Together, we are co-creators of the smart solutions that improve today, work tomorrow and empower adaptive change. Putting data to work to boost safety, efficiency, productivity and quality outcomes remain values we share with you.



Our focus is on autonomy.

Leveraging data to its fullest potential is the outcome we want – **moving beyond automation to autonomy.**

Our commitment is to innovation.

With **nearly 4,000 employees in R&D and thousands of active patents,** our technology leadership is clear.

Our value is strategically vital.

Efficiency, productivity and quality result in scalable sustainability – fewer resources, less waste and less pollution.

Our stability is consistently proven.

Sales growth from €500 million in 2000 to **€5.2 billion** in 2022 with approximately **24,000 employees** across **50 countries.**

About Octave

Octave helps clients design, construct and operate more profitable, safe and sustainable industrial facilities. We empower customers to unlock data, accelerate industrial project modernization and digital maturity, increase productivity and move the sustainability needle. Our technologies produce actionable insights that enable better decision-making and intelligence across the asset lifecycle of industrial projects, leading to improvements in safety, quality, efficiency and productivity, which contribute to Economic and Environmental Sustainability. With 50+ years of experience in delivering innovative industrial software, Octave Solutions transform unorganized data into intelligent, actionable information that enables smarter design, construction and operation of industrial projects across the asset lifecycle.



Awarded solutions provider

Ranked No. 1 over 13 consecutive years, across **5 different categories,** recognized in 2019 by ARC Advisory Group

R&D focused

More than **19%** of total revenue invested in 2022

Global presence

More than **4,000 employees,** with offices in **50 countries**

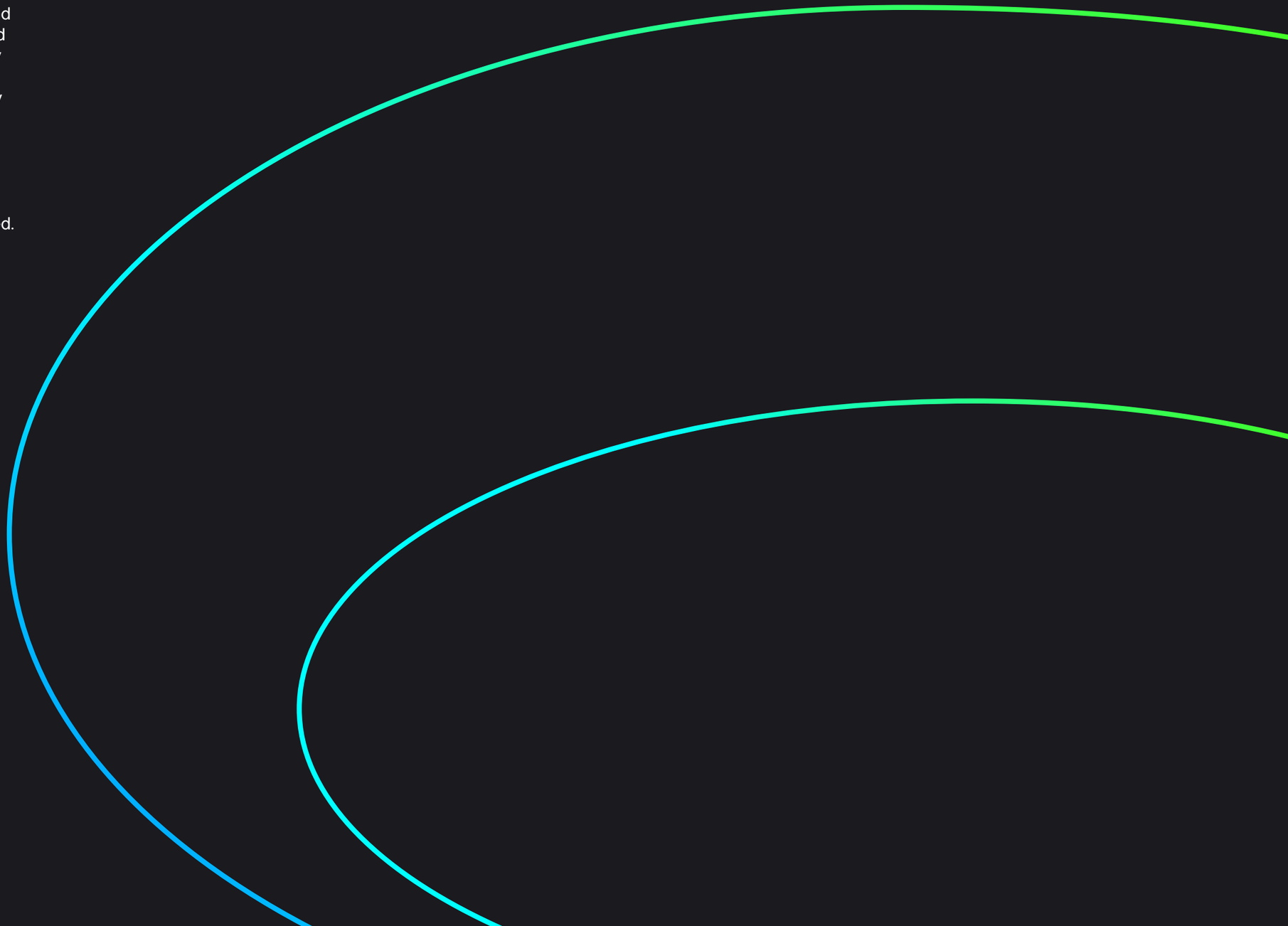
Innovative

More than **40 registered patents** around the world

About Octave

Octave is a leader in enterprise software, turning data into decisive action and intelligence into your edge. Our software solves for and simplifies complexity, from the design and build to operations and protection of people, property and assets – for any scope, at any scale. For decades, we've partnered with customers to sharpen performance, elevate efficiency and amplify results. From factory floors to entire cities, our solutions are tuned to scale up what's possible from day one onward.

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