



The compliance conundrum:

How industrial facilities can stay ready for what's next

EBOOK

The compliance conundrum

There have been several incidences in recent years where, due to outdated compliance practices, companies have faced heavy penalties and other consequences. In some cases, companies have followed compliance checklists but have not adapted to new environmental reporting standards. This resulted in operational delays, reputational damage and a rush to implement last-minute fixes.

Global regulatory fines skyrocketed to a record-breaking \$19.3 billion in 2024. The EPA has intensified enforcement actions across various heavy industrial facilities, including mining, petrochemicals and manufacturing. Stricter environmental laws, technological advancements and global trade policies have made these regulations even more critical. Compliance now requires adapting to complex, shifting regulations that affect operations at every level.

So, is your compliance strategy helping you stay ahead or just keeping you out of trouble?



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The changing face of compliance

Governments worldwide are tightening regulations focusing on sustainability, safety and ethical operations. For companies that operate across multiple regions, following these emerging rules is more challenging than ever. A few key developments include:

- **EUROPE:** The Carbon Border Adjustment Mechanism (CBAM) now places tariffs on imports based on emissions, impacting global supply chains. By 2027, the Corporate Sustainability Due Diligence Directive (CS3D) will enforce stricter environmental and human rights oversight for multinational corporations.
- **NORTH AMERICA:** ISA84, the standard for functional safety in the process industries, has undergone significant development over the years. The ISA84 committee is developing a new standard, Functional Safety of Process Safety Controls, Alarms and Interlocks (PSCAI). This standard focuses on applying Electrical/Electronic/Programmable Electronic Systems (E/E/PES) in process safety applications and aims to define clear requirements for achieving functional safety through PSCAI as protection layers. Although the committee has not yet finalized the implementation timeline for the PSCAI standard, they expect to release it soon as development continues.
- **ASIA-PACIFIC:** China's revised Solid Waste Law increases accountability for industrial waste management. Whereas, in India, the Extended Producer Responsibility (EPR) framework requires manufacturers to take responsibility for plastic waste collection and recycling.

Compliance has become a strategic issue for global companies rather than just a legal requirement that affects market access, supply chain decisions and corporate reputation. A single compliance failure can impose hefty fines on companies, leading to canceled contracts, restricted exports or serious repercussions for employees, including injuries or casualties.



The rising cost of non-compliance

The cost of non-compliance doesn't stop at regulatory penalties. It may cause more damage, such as operational delays, shutdowns and loss of public trust. For example:

- Manufacturers may face heavy fines for failing to comply with emission standards or manipulating emission tests, resulting in environmental and regulatory violations.
- Chemical and Petrochemical organizations can be left with penalties for improper disposing of hazardous waste and violating environmental rules and regulations.
- Metals and Mining organizations may also face backlash and other regulatory penalties for harming sites of interest, such as significant heritage sites.

It is, therefore, critical for industrial facilities to meet shifting regulations and adapt to future compliance demands. Non-compliance doesn't just result in fines or reputational damage; it can lead to high-consequence events that cause serious health and safety incidents. As regulations tighten, companies cannot afford reactive compliance. A proactive, tech-enabled approach can help reduce compliance violation risks by 76%, according to IBM Security research.

For industrial companies, the question is no longer, "Are we compliant today?" but "Are we prepared for what's coming next?"



Why traditional compliance strategies no longer work

For many industrial facilities, compliance is just an administrative task managed with spreadsheets, periodic audits and reactive processes. However, these obsolete methods become a liability as regulatory demands grow.



The burden of increasing documentation and reporting

Modern regulations require continuous data collection, audits and reporting, from sustainability disclosures and emissions tracking to workforce safety logs. Many companies struggle to match the pace, as their compliance teams wrangle manual reporting and paperwork.



Compliance is becoming more operationally intertwined

Compliance used to be handled by a dedicated team other than operations. It now touches every part of operations, from supply chains and raw materials to final safety checks, making collaboration essential. Companies that don't integrate compliance into day-to-day operations may face inefficiencies and higher costs, which can increase the risk to their operations.



Workforce constraints and a gap in expertise is growing

Many compliance teams face challenges while managing multiple frameworks with limited resources. As regulatory complexity grows, companies require experts who understand global compliance landscapes. However, many struggle to attract and develop the right talent because of a shortage of skilled professionals, rising demand across industries and the frequent shifts in the required expertise.



Maintenance

Companies continuously collect and analyze data on asset conditions to identify maintenance needs and prioritize repairs or replacements. They can also analyze historical maintenance data to refine maintenance schedules, improve asset longevity and reduce operational costs.



The future of compliance: smart, proactive and integrated

Relying on traditional methods such as spreadsheets and manual audits increases the risk of errors and slows decision-making. The future of compliance isn't just meeting requirements; it's predicting failures before they happen, automating compliance workflows and integrating compliance with operations.

Real-time compliance monitoring

Imagine a compliance system that continuously monitors operational risks by flagging potential errors before they get worse. That's exactly what some industrial leaders are adopting through IoT sensors, AI-driven analytics and automated reporting tools.

Deepwater Subsea was spending too much time manually gathering data and pulling reports from different systems—a process that was slow, error-prone and hard to scale.

To fix this, the company implemented Octave InConcert Core (formerly HxGN SDx®) and Octave Tempo Operations Management (formerly j5 Operations Management Solutions). The new system allowed them to monitor equipment in real-time, automate reporting and keep all compliance records organized in one place.

The switch meant less time spent chasing paperwork and more confidence during audits. Manual systems made it hard to stay ready for the audit. After switching to an automated platform, Deepwater Subsea cut reporting time by 95% and significantly reduced compliance errors.



PETRONAS is another example of an organization that understood that a more demanding external and internal environment required a renewed focus on operational excellence, remote monitoring and digitalization. They developed a PRIME initiative, an acronym for Predictive Revitalization of Instruments to Maximize Efficiency. PRIME focuses on three aspects of plant operations at Upstream (one of Petronas' three major operating divisions):

- Safety – improving process safety performance
- Reliability – improving process control performance.
- Cost efficiency – strengthening risk management performance.

PETRONAS implemented Octave Tempo Control System Effectiveness (formerly PAS PlantState Integrity) to ensure safe, reliable and cost-effective operations, and it paid dividends. For example, the new alarm management capability at one plant has led to an almost 90% reduction in alarm rates, with average alarms per hour per operator falling from 44.5 to 5.6. As well as a clear operator efficiency gain, PETRONAS executives appreciate that an effective alarm management system translates to an absolute reduction in process safety risk, as critical situations are far more likely to get priority for any necessary remedial action.

Also contributing to improved process safety is the marked reduction of unnecessary safety instrumented function (SIF) bypasses, which fell from 101 to just seven at one offshore platform after the implementation. PRIME-IPM also facilitates the Bypass Governance Model, which PETRONAS Upstream has introduced to provide a procedural rather than the previously somewhat ad-hoc approach to activating, monitoring and deactivating safety bypasses.



Digital documentation and audit readiness

Gone are the days of rushing to find compliance records before an audit. With cloud-based compliance management, companies can keep documentation updated and instantly accessible.

Biomass Industries Associates (BIA) is an example of an organization that knew that relying on outdated methods such as spreadsheets and manual audits increases error risk and slows decision-making. The future of compliance isn't about checking boxes; it's about predicting risks before they happen, automating compliance workflows and integrating compliance with operational workflows.

When BIA undertook the largest project in its history, a refinery with a capacity of 3,000 tons per day, it needed engineering software solutions that could significantly increase collaboration between functions. Using Octave Forte 3DWorx (formerly CADWorx®), 80% of the project could be completed in a single package, meaning no file conversion was necessary and everyone always had an up-to-date view of the model. Having one single model meant relevant real-time data was visible and accessible and BIA significantly reduced the risk of manual transcription errors.

Predictive compliance and risk management

What if companies could more easily understand how regulations affect operations and prepare in advance? AI-powered analytics are now making this possible, helping industries keep up with changing compliance requirements.

For example, petrochemical companies are now using AI-powered emissions monitoring to track pollutants in real time. Rather than waiting for quarterly reports, these systems can immediately detect and alert teams to inconsistencies, helping companies avoid fines and reduce environmental impact.



Integration with operational data

In the past, compliance was treated as a regulatory burden, something separate from business strategy. But leading companies are reframing compliance as an integrated part of business operations, embedding it into broader operational, quality and sustainability initiatives to gain a competitive edge.

For instance, when Godrej PED was contracted to construct an 882-ton pressure vessel for Saudi Basic Industries Corporation, compliance with ASME U2-Stamp standards was a major challenge.

Instead of managing documentation manually, the company integrated compliance directly into its engineering workflow using Octave Aspect Pressure Vessel (formerly PV Elite®) pressure vessel analysis software—ensuring for a smooth regulatory process and on-time project delivery.

Building compliance systems that evolve with regulation

As global regulations grow more complex and interconnected, industrial companies can no longer rely on periodic audits or manual reporting to stay compliant. A future-proof compliance strategy requires a proactive, integrated approach designed to minimize risk, improve operational efficiency and build regulatory resilience.

1. Conduct a comprehensive compliance risk assessment

The first step toward future-proofing compliance is understanding risks and vulnerabilities within an organization. A detailed risk assessment helps identify issues in operations, supply chains and reporting systems, ranging from manual record-keeping to supplier dependencies that could lead to huge penalties or operational disruptions. Identifying these risks helps businesses create a foundation for targeted improvements and strengthened compliance processes before issues escalate. This is increasingly critical as regulations around environmental impact, supply chain transparency and workplace safety become stricter.



2. Invest in compliance automation and real-time monitoring

Manual compliance tracking is no longer sustainable in industries facing complex and evolving regulatory landscapes. Investing in automation, through IoT sensors, AI-driven analytics and cloud-based platforms, allows companies to monitor compliance in real-time, detect risks early and generate reports instantly. These systems provide greater operational visibility, enabling teams to address potential violations before they turn into costly incidents. In sectors like oil and gas or chemicals, where safety and environmental risks carry significant consequences, real-time monitoring is an essential requirement for security and business operations.

3. Foster cross-functional collaboration

Future-proof compliance strategies depend on breaking down organizational silos and embedding compliance into daily operations. It's no longer the sole responsibility of legal or regulatory teams; operations, engineering, sustainability and supply chain teams must work together to manage risks. Operations teams directly affect compliance through how they run, maintain and secure facilities. Integrating compliance into supply chain management helps track third-party risks tied to emissions, labor practices or trade restrictions. At the same time, collaboration with sustainability teams ensures accurate environmental data for ESG reporting. This cross-functional approach reduces non-compliance risk and ensures that businesses meet the regulatory requirements without slowing operations.

4. Prepare for ESG and sustainability regulations

As global ESG and sustainability regulations get tough, companies that proactively track and report environmental and social impact data gain a strategic advantage. Future-ready compliance programs focus on gathering data on carbon emissions, resource consumption, waste management and labor practices early on. This approach ensures smoother regulatory compliance and strengthens accountability to investors, customers and regulators. By including ESG readiness in compliance strategies, companies can surpass regulatory defense and position themselves as responsible, transparent market leaders.



The challenges of manual, slow and fragmented compliance audits became increasingly unsustainable, especially as regulations began to tighten in 2011 and beyond. Using InConcert Core and Tempo Operations Management has transformed the approach of many heavy industrial organizations by enabling real-time tracking of safety and operational compliance and created a single source of truth for all regulatory documents and automating reporting tasks that previously required significant manual effort. This digital shift results in faster audits, reduced compliance costs and a more substantial regulatory reputation, demonstrating that future-ready compliance is less about doing more work and more about working smarter through technology-driven efficiency.

In the era of a complex regulatory landscape, industries are under greater pressure to maintain compliance while managing operational risks. Traditional processes can no longer guarantee efficient, accurate or timely risk mitigation. However, digital transformation can help shift compliance from a regulatory burden to a strategic advantage, improving operational performance, strengthening supply chain transparency and building long-term resilience.

Hexagon's solutions for compliance excellence are designed to support this transformation. Its technology helps industrial facilities simplify compliance tracking, integrate real-time data and future-proof their regulatory readiness. See how our solutions help you eliminate compliance blind spots. Schedule a consultation.

For further insights, read our blog: "Beyond Compliance: Building a Culture of Safety Through Digitalization."



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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