Janus24™ real-time monitoring platform

Digitally enabling the oil and gas industry to operate safely and comply with federal regulations

Abstract

In the moments following the Deepwater Horizon oil rig disaster, the initial response teams were unable to effectively troubleshoot the Blowout Preventer (BOP) due to a lack of understanding of the final state of the control system. This lack of knowledge greatly hindered the teams from acting in the most critical moments. On April 19, 2019, The Bureau of Safety and Environmental Enforcement (BSEE) mandated that any oil rigs drilling in the Gulf of Mexico must actively monitor the subsea BOP and control system in real-time.

Michael Fry, President and CEO of Deepwater Subsea LLC

In addition, the new regulations require that all companies must track, trend and report on equipment failures, abnormalities and overall system health. By utilizing the OSIsoft PI System™ and various solutions from the OSIsoft Partner EcoSphere – including HxGN SDx® Operations and j5 Operations Management Solutions – Deepwater Subsea LLC has developed the Janus24 real-time monitoring platform, an industry first solution that combines real-time data, compliance verification inspections and asset lifecycle management in a data ecosystem that allows oil and gas companies and drilling contractors to operate safely and in compliance with federal regulations. This case study highlights that implementing value-adding solutions from the OSIsoft Partner EcoSphere can positively impact real oil and gas industry problems, for example helping to decrease operational risk and increase regulatory compliance.

Michael Fry's background

Michael Fry is the President and CEO of Deepwater Subsea LLC, based in Katy near Houston, Texas. Michael has over 20 years of experience in the oil and gas industry, working across various disciplines and was the supporting Subsea Superintendent for Transocean when the Deepwater Horizon tragedy occurred. His experience of the devastating impact that outdated processes can have when it comes to operations, compliance and safety inspired him to found Deepwater Subsea in 2015. Deepwater Subsea focuses on subsea operations, real-time monitoring, competency development and training with the aim to end preventable errors that

cause incidents through digital transformation and operational excellence. Its industry-first Janus24 real-time monitoring platform combines information that was previously siloed on paper, spreadsheets, hard drives and other disconnected databases into a central digital solution, which also allows the quick distribution of compliance reports to government regulators. Before working in the oil and gas industry, Michael spent ten years in the US Navy on nuclear submarines, working with torpedoes, cruise missiles and weapons delivery systems.

Deepwater Subsea LLC's challenges

Deepwater Subsea was using inadequate and time-consuming word processor documents and spreadsheets for its human operations procedures. This made it difficult when tracking and tracing data, whilst lowering coordination, focus and operational productivity. Fry said it was a "nightmare" looking for historical information, especially when investigating that a specific inspection was completed and who performed the inspection. The auditability and proof of inspection activities is extremely important to comply with government regulations that were introduced after the Deepwater Horizon tragedy. Related engineering information – including equipment user manuals and P&IDs – was also stored across different computer folders and networks and as a result essential documentation was not quickly available when required during real-time inspection activities. The use of word processor documents and spreadsheets made it difficult to ensure information consistency and the recording of

critical overlapping data. From the start of the job until completion, unless the inspector or surveyor continually sent back a copy of their report, there would be no way to see the real-time status of their work. This was also a problem because to comply as an ISO 9001 company, it is essential that inspectors use the correct revisions of documents, fill everything in correctly and ensure full traceability and transparency. Documentation was very difficult to control, and as a result inspectors and surveyors often used old revisions of documents during their inspection activities. Unfortunately, there was no easy way to find out if these old revisions were being used until after the job was complete, which was too late and made it difficult to reach full regulatory compliance.

Deepwater Subsea continually observes drilling rigs across the world, which are operated by a variety of oil and gas companies, and as a result Deepwater Subsea is not the owner of the equipment being monitored. Also, because a lot of this equipment being monitored by Deepwater Subsea – such as Blowout Preventers (BOP) – is not easily accessible, it was difficult to report on the true operating status of that equipment in real-time. The lack of a centralized asset lifecycle information management system – which would link and organize related data from disparate sources – led to further documentation visibility gaps, which again meant it was an arduous task finding crucial documents related to the equipment being monitored by Deepwater Subsea.

This important engineering information – such as schematics and technical data – was held on various computer networks and systems of record across the different drilling rigs. No drilling rig is the same, and each has different data-recording requirements, so there was a big problem managing these growing data silos. This was especially so with the human operations procedures being recorded on word processor documents and spreadsheets, alongside the related engineering information being scattered across different cross-company computer networks.

Most time was wasted clicking between different screens to find crucial related information. For example, there was no link to the PI System during inspection activities, which meant that safety critical operations, engineering and real-time data was disconnected. Downtime or safety-critical events recorded by the PI System did not reach inspectors immediately, which delayed investigations and any remedial actions.

As the PI System is its core technology for real-time monitoring, Deepwater Subsea wanted a human operations procedures and engineering information management solution provider with an established bidirectional interface to the PI System. With the ever-changing regulations in the oil and gas industry and to continually maintain compliance standards, it was also important for Deepwater Subsea to be able to create and modify its operations and engineering software applications and documents without heavy reliance from a third party. Deepwater Subsea had previously tried to build its own digital checklist and human operations procedures software but became frustrated by the growing vendor involvement and financial cost to continually design and modify this homegrown software, and as a result that solution became a problem and was abandoned. Since being founded in 2015, Deepwater Subsea has grown quickly, and is continually hiring new staff in its real-time monitoring control room. Because day-to-day information being recorded by the control room and the field team was scattered across word processor documents, spreadsheets and various computer networks, it was very difficult to train and transfer knowledge to junior and new employees in a structured manner.

To solve these problems, get more out of its PI System investment and become the market leader in real-time monitoring for drilling rigs, Deepwater Subsea wanted to develop an industry-first solution, which powerfully combined human operations procedures and engineering information with the real-time and historical data managed by the PI System.

# How Hexagon and OSIsoft digitally enabled the industry-leading Janus24 real-time monitoring platform

To connect their operations, engineering and real-time data silos, Deepwater Subsea is utilizing the HxGN SDx Operations and j5 Operations Management Solutions, which are both developed by Hexagon, who is also providing additional value within the OSIsoft Partner EcoSphere. The combination of human operations procedures (j5 Operations Management Solutions), engineering information and schematics (HxGN SDx Operations) with real-time and historical data (PI System) has enabled the industry first Janus24 real-time monitoring platform developed by Deepwater Subsea. This has been achieved in a relatively short-time – especially in the typically slow-moving oil and gas industry – providing quick-time-to-value. In April 2018, representatives from Deepwater Subsea discovered Hexagon solutions at OSIsoft PI World 2018 in San Francisco. After more detailed discussions, a purchase order was sent in June 2018 from Deepwater Subsea to kick off the first phase of implementing j5 Operations Management Solutions. This implementation was completed in December 2018, about seven months from first exposure. In June 2019, Deepwater Subsea decided to purchase HxGN SDx Operations to enable its personnel to record and view all the related operations, engineering and real-time data streaming in from various drilling rigs on a single platform (and even on one screen in PI Vision™). These major steps towards developing and implementing comprehensive Digital Operational Twins inside the Janus24 real-time monitoring platform happened in less than two years after first exposure at OSIsoft PI World 2018.

Finding information now takes seconds instead of hours, and Janus24 real-time monitoring platform control room personnel and field inspectors are also coordinated, allowing them to be more focused and productive during their day-to-day activities.

Inspection records are now easy to find, and there is a clear audit of when the inspection was completed and who was involved, allowing excellent compliance with government regulations that were introduced after the Deepwater Horizon tragedy. Engineering information that is related to the human operations procedures and the PI Tags – including equipment user manuals, P&IDs and other technical documentation – is now presented efficiently on HxGN SDx Info Maps. The connected Hexagon and OSIsoft solutions allow relevant real-time data to reach inspectors as they work, and inspectors can also write value added human procedural data back to the PI System.

The mutually beneficial link between the Hexagon and OSIsoft solutions allow Deepwater Subsea to achieve ISO 9001 compliance because inspectors' activities can be monitored in real-time from start until completion. Inspectors are now always using the correct revisions of documents and recording data correctly, which ensures full traceability and transparency. This documentation revision control is now effectively managed by the Hexagon solutions and the instances of inspectors mistakenly using old revisions is a past problem. This ensures that the documentation used by Deepwater Subsea as part of its inspection activities is meeting compliance when completed and is continually updated in line with the ever-evolving government regulations, increasing the value and credibility of the Janus24 real-time monitoring platform.

Despite not being the owner, Deepwater Subsea can now effectively analyze and see the operating status of the equipment being monitored in real time. This is because with HxGN SDx Operations they have a centralized asset lifecycle information management system, which links and organizes related data from disparate sources across
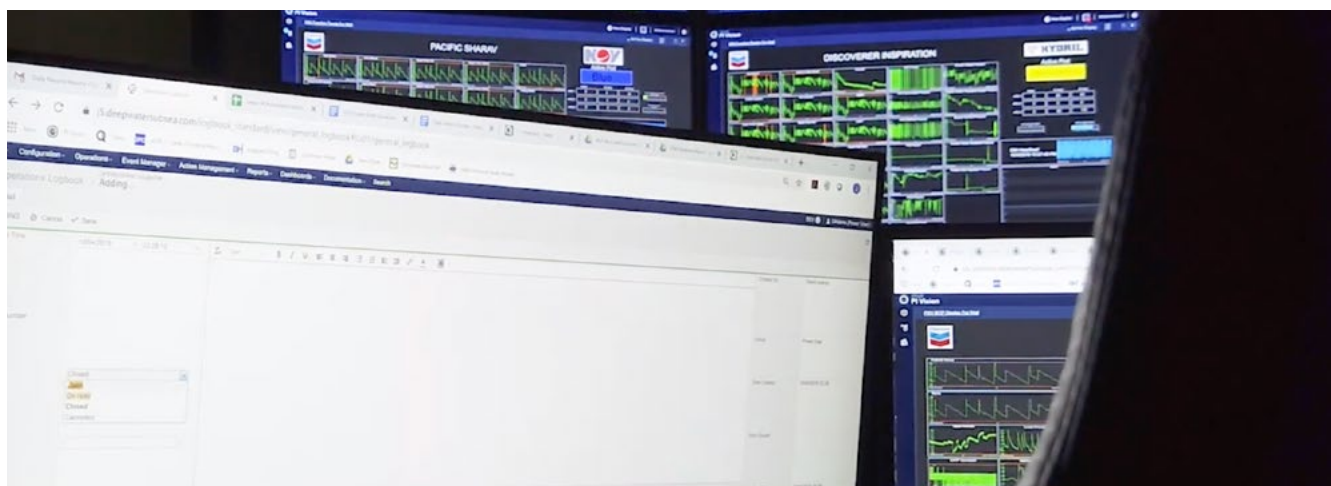
the drilling rigs they monitor. Trends from the PI System can be viewed quickly by clicking on linked PI Tags which appear within documents and records that relate to that part of the process (or even on 3D Models and Laser Scans). Finding crucial engineering documentation related to the equipment being monitored is simple with HxGN SDx Operations Info Maps.

Data silos have been reduced dramatically and much time has been saved because there is no more clicking between different screens, folders and software applications to find crucial related information. For example, Equipment or PI Tags are now used as the central reference point in a HxGN SDx Operations Info Map, which allows the quick viewing of all the human operations procedures, engineering documentation, real-time data elements, 3D Models, Laser Scans and any other useful information related to that Equipment or PI Tag. Downtime or safety-critical events recorded and highlighted by PI Event Frames™ now reach inspectors immediately, speeding up investigations and any remedial actions.

With the ever-changing regulations in the oil and gas industry, continually maintaining compliance standards is crucial. Deepwater Subsea can now create and modify its operations and engineering software applications and documents without heavy reliance from Hexagon. For example, j5 Operations Management Software is driven by j5 IndustraForm® Templates, and the j5 IndustraForm Designer allows Deepwater Subsea to easily create and modify its human operations procedures and documents – for use in both the desktop control room and field mobile inspections – without any major assistance from Hexagon using a familiar spreadsheet-like configuration environment. This allowed Deepwater Subsea to evolve the Janus24 real-time monitoring platform without the problems experienced when it tried to develop its own homegrown digital checklist and human operations procedures software with a third-party vendor who didn't have the oil and gas industry expertise of Hexagon. This ease of configuration combined with the best practice knowledge of Hexagon consultants allows Deepwater Subsea to benefit from the best of both the homegrown and experienced vendor approaches.

Investment in Hexagon solutions has also made it easier to train and transfer knowledge from senior to junior and new employees in a structured manner. Lessons learned can be documented and associated to Equipment and PI Tags easily using HxGN SDx Operations Info Maps. The human operations procedures managed by j5 IndustraForm Templates can also be easily modified in the j5 IndustraForm Designer to prevent future mistakes and guide personnel through difficult procedures. This ensures a culture of continuous improvement with the Janus24 real-time monitoring platform.

Benefits and results

Deepwater Subsea has achieved a 70% savings in productivity in human operations procedures, documentation and the completion of inspections. There has also been a 95% savings in time retrieving and searching for quality evidence post inspection. The inspectors now load findings directly into a digital report which eliminates the need for additional filing of reports and records. j5 IndustraForm Templates allow Deepwater Subsea to consolidate all its word processor documents and spreadsheets into a single enterprise system. It also provides a clear and simple approach, avoiding third party assistance in adding and modifying documentation and forms to meet specific oil and gas industry requirements and changes.

There are now clear standardized processes for different inspector's management and completing of actions with consistent formatting, structure, workflows and content entry, leading to better ISO 9001 compliance. Hexagon and OSIsoft solutions are enabling greater transparency which has improved Deepwater Subsea's creditability in the oil and gas industry. Janus24 real-time monitoring platform customers can now also access their own previously unstructured data easily with user accounts provided by Deepwater Subsea. This gives customers who are operating drilling rigs visibility and the ability to interact with inspectors, something which they have never had before in oil and gas industry.

Gone are the instances of inadequate shift handover reports and forgetting what happened and when. With the ability to search all the records with rich text, Deepwater Subsea can capture real lessons learned moments and share them across the company. Compliance documents and reports which need to be routinely sent to government regulators like the Bureau of Safety and Environmental Enforcement (BSEE) can now be completed and distributed in just a few minutes with the Janus24 real-time monitoring platform. The combined Hexagon and OSIsoft solutions allow the data

required by these regulators to be collected in real-time and populated into pre-defined structures, removing the time-wasting process of gathering and rewriting the data from disparate sources.

With the Janus24 real-time monitoring platform, Deepwater Subsea has developed an industry-first solution which powerfully combines human operations procedures and engineering information managed by Hexagon with the real-time and historical data managed by the PI System. The Janus24 real-time monitoring platform has solved a multitude of problems that Deepwater Subsea experienced working with inadequate word processor documents, spreadsheets, siloed engineering information and disconnected real-time data. The Janus24 real-time monitoring platform has also allowed Deepwater Subsea to get more out of their PI System with Hexagon solutions and more out of their Hexagon solutions with the PI System.

In the late 20th century whilst performing troubleshooting, repair and preventive maintenance on equipment during his time with the US Navy, Michael Fry – the President and CEO of Deepwater Subsea – wished that siloed operations, engineering and real-time information could be seamlessly connected to increase the efficiency of his day-to-day tasks. In the fast moving 21st century, value-adding solutions from Hexagon, OSIsoft and other members of the OSIsoft Partner EcoSphere are at last breaking down these silos. Deepwater Subsea has grasped the opportunity to become an early adopter of these breakthrough digital transformation initiatives in the oil and gas industry, and is positively impacting the day-to-day compliance, efficiency and safety problems faced by its peers. A 20th century dream, the Janus24 real-time monitoring platform is a now a reality with proven results, and Deepwater Subsea is now geared up to become the global market leader in real-time monitoring for drilling rigs.

> **The combined Hexagon and OSIsoft solutions are a major part of pushing our business to the next level. Before this combination we were pulling all the PI System Tags to match what was on the P&IDs. We can now pull up the P&IDs in HxGN SDx Operations, click on a piece of equipment and have the trends from the PI Tags appear on the same screen.**
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> **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."**

Michael Fry
President and CEO, Deepwater Subsea LLC

Hexagon is a global leader in sensor, software and autonomous solutions. We are putting data to work to boost efficiency, productivity, and quality across industrial, manufacturing, infrastructure, safety, and mobility applications.

Our technologies are shaping urban and production ecosystems to become increasingly connected and autonomous — ensuring a scalable, sustainable future.

Hexagon's PPM division empowers its clients to transform unstructured information into a smart digital asset to visualize, build and manage structures and facilities of all complexities, ensuring safe and efficient operation throughout the entire lifecycle.

Hexagon (Nasdaq Stockholm: HEXA B) has approximately 21,000 employees in 50 countries and net sales of approximately 3.9bn EUR. Learn more at hexagon.com and follow us @HexagonAB.