



How **OSIsoft's** digital transformation solutions are driving value and results in unconventional oil and gas

Whether you are drilling a horizontal well, cementing, fracturing or acidizing the well, or running a coiled tubing rig with a perforation tool, OSIsoft's digital transformation solutions can collect and structure data for analysis and future growth

Try the PI System



www.osisoft.com



High-quality data is the means by which oil and gas companies innovate, improve, and drive efficiency in all aspects of their operations. With technology usage increasing exponentially year-on-year, and the appetite for tech disruptors growing at an alarming rate, most oil and gas companies are now preparing to move away from legacy collection and storage at an impressive pace.

From customer information, to data collected from smart machinery in multiple sites, there are too many data sources for companies to manage. Rather than striving to collect more and more data, the focus is now shifting to how to manage vast and disparate quantities of information. As crazy as it may seem, the warning that neglected data lakes will stagnate into swamps has never been more pertinent. Businesses are getting overwhelmed, and the flood of data needs to be organized, analyzed, and acted upon—but how to proceed?

DATA VOLUME & DATA SOURCES

The PI System has been around since 1984, the intent of which is to collect data before that data is purged from the system. Being able to store and analyze the data surrounding expensive equipment provides a huge productivity boost to those assets. Put simply, you can't get more efficient by simply storing or purging data. As a result, the PI System is the ultimate engineer's toolkit, covering everything from data analytics to machine learning.

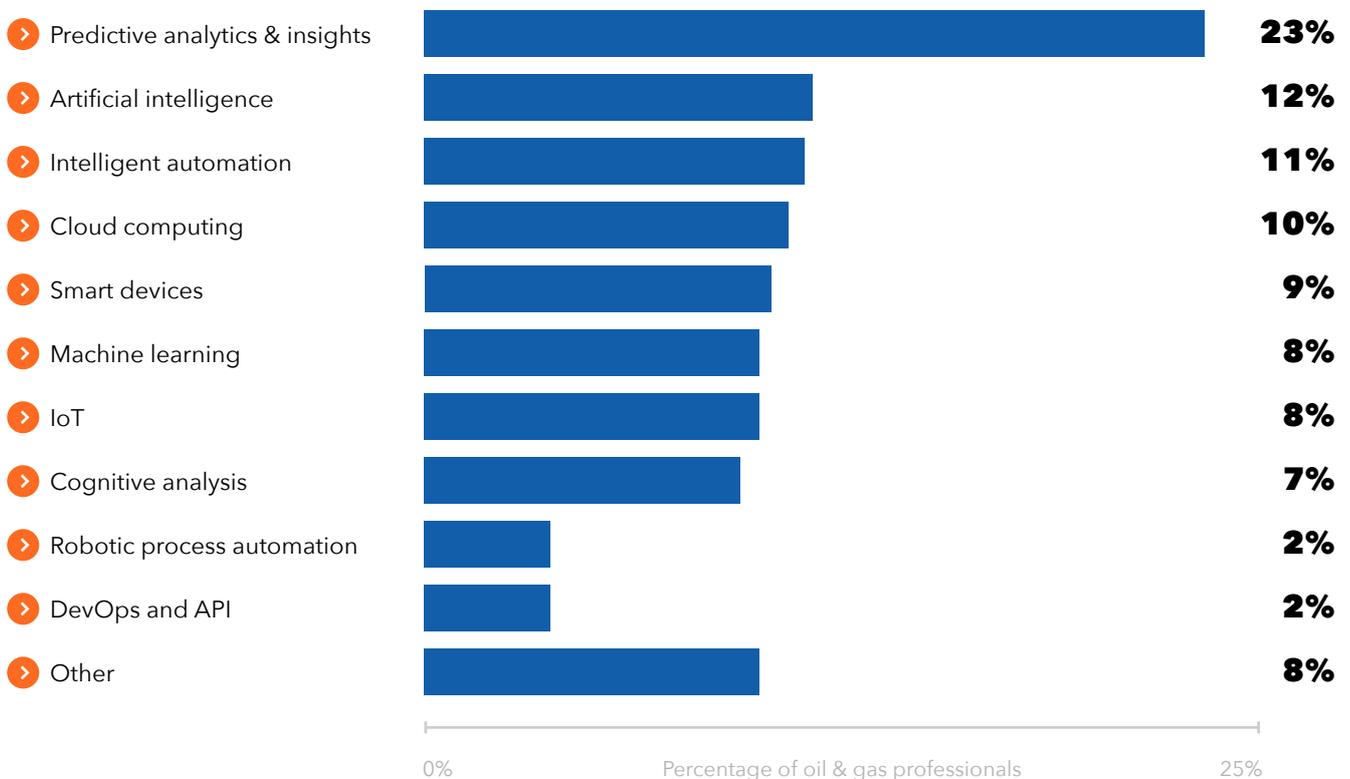
The companies dealing with the largest volumes of data are those operating over multiple sites, those harnessing data from varied departments and asset types, and those embracing technologies such as big data, the IIoT, and edge computing. These drivers for change have created new issues, and to remain competitive, areas for improvement need to be identified as quickly as possible.



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The problem for many companies looking to embrace the digital transformation is that the key driver is cost-cutting. Based on the findings of a recent survey, Oil & Gas IQ found that predictive analytics was by far the highest priority across oil and gas professionals looking to transform the digital side of their business.

WHERE IS YOUR CURRENT PRIORITY IN TERMS OF DIGITAL TRANSFORMATION?



This clear preference for predictive data solutions is indicative of the faster, more informed decision-making that comes with an analytics and insights package. Inconsistent and disorganized data can be prepared for analytics, and separate entities within both operations and the business can be joined. Maintenance becomes more effective; operators can access surface data more easily; the frequency of failures can be reduced, and the final result is far greater operational efficiency. The end goal is asset uptime and revenue capture, as predictive packages can unlock huge cost savings.

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CHALLENGES IN THE UNCONVENTIONAL PRODUCING SPACE

Since the mid-2000s, innovations in oil and gas production have further complicated the task of remaining up-to-date with predictive analytics solutions and the wider goal of total digital transformation. One such innovation that is now growing in popularity is pad drilling.

Since its first usage in 2004, the horizontal multi-well drilling method is fast becoming the new normal, particularly in areas with limited surface space for multiple vertical one-well sites. While based predominately in the Bakken, Eagle Ford, and Marcellus Formations—pad drilling is spreading rapidly. These wells begin close to one another, but spread out horizontally, often exceeding 1 km in length, and potentially lasting over 150 fracturing stages. They also have a very short lifespan compared to conventional wells.

“The PI System allows you to simultaneously work on layers of analytics—users can go on to use higher level analytic capabilities to get more and more value out of PI—something most systems cannot do.”

With many well types, but particularly with pad drilling, the following areas are of notable concern, and can all be managed by systems such as OSIsoft’s PI System:

- ▶ Drilling data management is made difficult because many engineering applications are reliant on instant communication and need immediate and up-to-date downhole and topside information.
- ▶ Frequent movement between wells and many fracturing stages mean that the operations and management conditions constantly need monitoring.
- ▶ Bit conditions, revolutions, torque and bit pressure, reservoir management, analyses and the evaluation of varying reservoir conditions is an ongoing monitoring issue.



THE PI SYSTEM AND DATA PROCESSING

All the pieces needed to solve problems with operations—from condition-based maintenance or asset health—can be assisted by a real-time data platform. The OSIsoft platform captures key drilling events, stick-slip, and associated key attributes such as rate of penetration and key calculations such as drill string volume. In addition, the visualization of multiple wells and drilling, completion or production progress is very valuable.

Using drilling data allows the system to present attributes in categories to help organize the vast amount of data. There are calculations included, such as those needed to measure drill string volume, differential pressure, hookload and measured depth—the observations critical to the events that are going to be measured and calculated.

“The lifecycle of an unconventional well is much shorter than a traditional well, so operators have to be able to handle water due to the massive amount of fracturing stages.

“It is common for events to have triggers dependent on multiple variables—such as RPMs, horizontal and vertical locations and depth change. Equipment attributes can be loaded into the system, as well as production areas and well pads, to provide a hierarchy of event prediction.”

The PI System supports such endeavors, and can process huge volumes of data regarding water-processed disposable wells, and assist in the automation of wells to tanks to salt water disposal wells or trucking logistics.”

Additional categories such as specifications and well information are the first entered into the system by an engineer. In a real-world production environment, this data would come from field measurements.

Analysis capabilities of the PI System include high-level asset framework such as completions and drilling stages—each working with a simple trigger of well state. Key events can then be monitored. Rotary drilling, sliding, and stick-slip are some such groupings.

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DRILLING AND COMPLETIONS WITH REAL-TIME INTELLIGENCE

Completions are a major part of well processes, and by using the PI System, all the data from multiple parts of the drilling and production process are brought together.

The PI System has a history within oil companies that begins with a role more akin to a real-time data historian than a system for optimizing operations. This beginning role has developed over the past thirty years into integrations and applications infrastructure, then remote monitoring, and finally for remote optimization and investigation of new opportunities. Many companies use multiple PI Systems, with Shell using over 250.

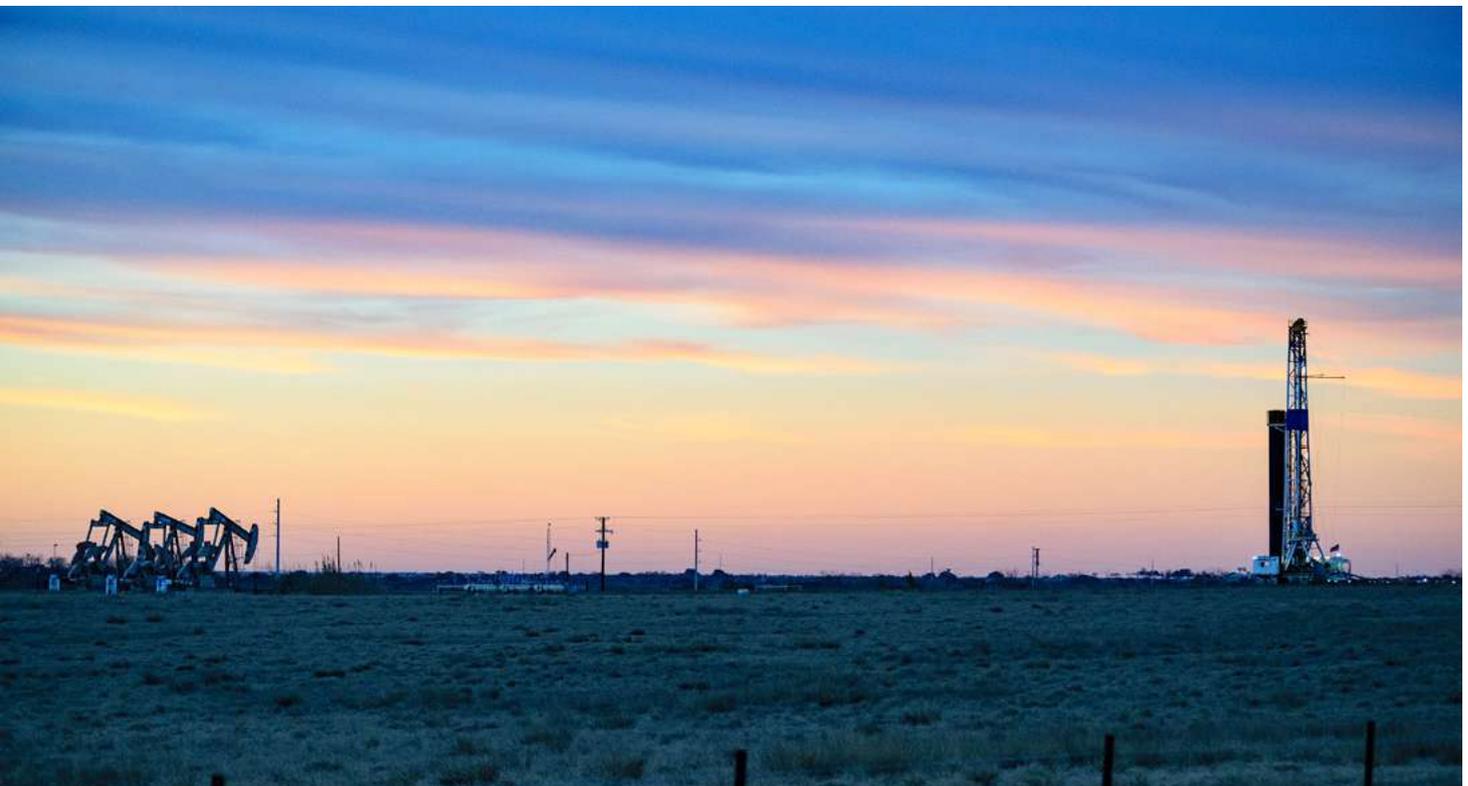
“Oil and gas companies can even create a ‘golden well’, a perfect example against which all subsequent drilled wells can be compared to.”

Data comes from assets through private company

network architectures which then goes into the PI System. This data then moves into PI System components such as Vision and System Explorer which can visualize and analyze the data. Many companies are now comfortably working with one-second data that gives a much higher level of precision than other resolutions such as 10 or 20 second data. Sub-second data is now becoming more common, particularly for issues like vibration.

Programs like Vision allow the data from the PI System to be considered alongside other operational elements such as geological information. Data exports allow the user to pull xml files of the specific data ranges they are interested in.

The PI System can also be used in conjunction with other databases to present a picture that is both time-based (PI) and depth-based.



DRILLING AND COMPLETIONS CASE STUDY

Devon Energy



Drilling is an event-based process. One of our customers, Devon Energy, decided the best way to address this was performance-based engineering. Devon Energy utilized the WellCon facility integrated operations center with this, they gained improved visualization analytics tools to drive efficiency.

The tools enabled the company to leverage real-time data, multi-disciplinary collaboration throughout the drilling process and completions process, and the ability to drive data decision-making.

This was key to improving efficiency, as the drilling process traditionally utilizes several applications simultaneously, especially drilling in verticals and laterals. The ability to understand all operational processes in real time is vital in this regard.



One way in which Devon Energy used the WellCon facility was for rotary trend analysis, to help them land the drill bit more consistently in the location they intended-proving to be a huge help in instances where they landed close to their expected position. WellCon is able to measure the exact deviation, enabling future improvement and huge cost savings. The tool also reveals granular information, such as the turn rate, build rate and weight of the bit on the surface.

WellCon Toolbox-Core functions

- ▶ Improving visualization and analytics
- ▶ Rotary trends and analysis
- ▶ Real-time offset comparison
- ▶ Event frame generation
- ▶ Fracturing interference monitoring
- ▶ Well comparison, historical data and real-time data
- ▶ Coil tubing analysis

PRODUCTIONS CASE STUDY

YPF



To ensure well integrity and safety, it is vital to remove efficiency barriers as soon as possible. However, more wells means more data to oversee, and for large organizations, the ability to monitor wells and solve production issues quickly becomes increasingly difficult via traditional methods, such as spreadsheets. The solution is a full-spectrum well visualization system.

YPF has over 17,000 oil wells in 220 oil fields, supervised by 14 different production and artificial lift methods controllers. Understandably, YPF wanted to understand their level of operational efficiency across all wells—not just to fix issues—but to ensure the efficiencies they were best at are applied to other areas.

Instead of using a spreadsheet-based system, they used iUp Web to create widgets for their production processes, including:

iUp Web-Core functions

- ▶ Well torque
- ▶ Goodman
- ▶ Pump
- ▶ ESP curves
- ▶ Dyna cards

The result is what they call a well overview visualization, which provides YPF with an easy-to-understand overview of each of those 17,000 individual wells.



Within each widget, YPF gained a granular view of the processes. For example, the beam pump torque widget shows granular information, such as minimum net torque and minimum CLF, providing actionable data to ensure the right type of beam pump is in place.

In addition, the beam pump widget revealed metallurgical stresses improving their ability understand what is happening in each pump. Understanding the operating window and operating envelope for a pump is critical for that pumps operational procedures, and YPF made huge cost savings in utilizing real-time data for ESP pump curves, which is affected by many different variables.

Lastly, the dyna card diagnostic widget provided key performance indicators that reveal a wide array of insights in the shape of the dyna card output. For example, it would reveal if there was a hole in the tubing, or if the pounding fluid output wasn't optimal. All of this can be incorporated within production scenarios.

Overall, it is important to understand what you need and how you can achieve it, and to bring engineering and operations together to look at the data from all angles and improve upon it—resulting in huge cost savings and boosts to efficiency.

CONCLUSION

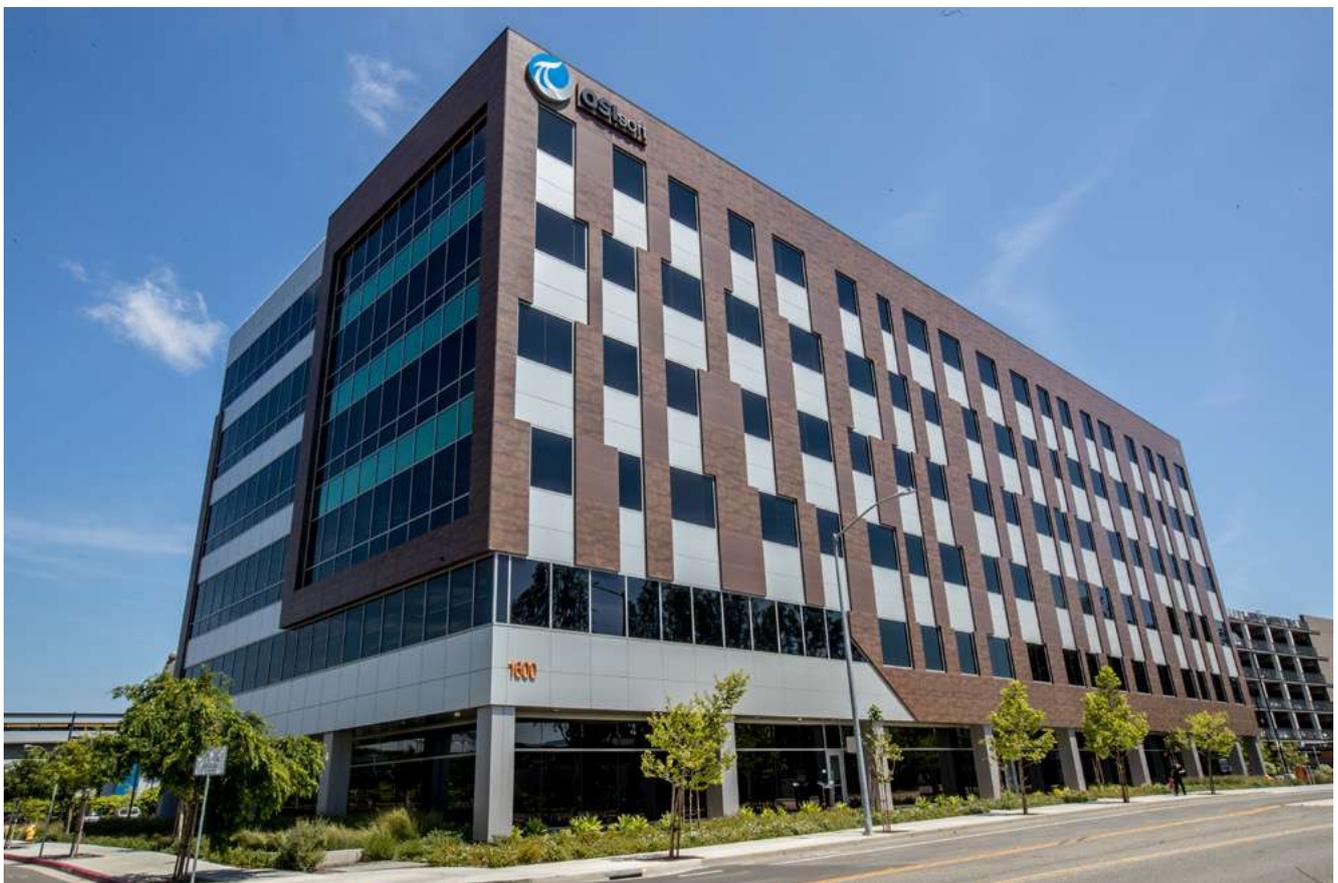
By using the PI System, a company can have a mobile asset associated with a drilling rig or completion process. When drilling a well, for example, it eventually becomes a producing well, and the rig itself moves from location to location. The rig can change its tag each time but the well is not mobile. With the PI System, you can synchronize the data from the drilling process to the production process—the biggest challenge in this space—to look at the data as you’re drilling. This allows all the data from multiple vendors and multiple parts of the process over the various stages of fracturing and completing the well to be analyzed and acted upon simultaneously.

The PI System is different to other data systems due to the granularity of its data. In the past, a large proportion of a company’s operations were understood by engineers by taking a time slice and then analyzing it over time. With real-time and second-base data, however, you can analyze multiple tags at a similar time, or as OSIsoft calls it, real time all the time.



ABOUT OSIsoft

OSIsoft, a global leader in operational intelligence, delivers an open enterprise infrastructure to connect sensor-based data, operations, and people to enable real-time and actionable insights. As the maker of the PI System, OSIsoft empowers companies across a range of industries in activities such as exploration, extraction, production, generation, process and discrete manufacturing, distribution, and services to leverage streaming data to optimize and enrich their businesses. For over thirty years, OSIsoft customers have embraced the PI System to deliver process, quality, energy, regulatory compliance, safety, security, and asset health improvements across their operations. Founded in 1980, OSIsoft is a privately-held company, headquartered in San Leandro, California, U.S.A., with offices around the world.



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