The Great Data Transformation: How the Industry Is Capitalising on Digitalisation

Part 1: Real-Life Examples From TransCanada, Petronas, and ADNOC Onshore

Russell Herbert, Industry Principal for Oil & Gas

Wading through the information swamp

As the oil and gas industry becomes increasingly digitised, torrents of data are being unleashed that can easily overwhelm companies if not properly managed.

The deluge of new data raises important questions. How should it be organised? Can it be presented in a meaningful way? Who should have access to it? These questions need to be answered to make the most of the data and turn it into value-adding information.

At any modern-day oil and gas operation, three big changes are taking place that one should consider when looking for the best approach to the digital transformation.

The first is the accelerating growth of data generated by assets. The second is the increasing importance of emerging technologies, such as Internet of Things (IoT), cloud and data analytics, which are having a big impact. Finally, the third is that within every company there is a growing appetite for collecting and leveraging data from an increasing number of groups and specializations.

Together, these drivers are making oil and gas operators focus on designing a centralised strategy for managing their operational data as they pursue "intelligent information" – rather than merely collecting volumes of data that will languish unused in data swamps.

OSIsoft.

The opportunities offered by converting raw data into value-adding intelligence are immense, which is why industry leaders including Saudi Aramco, Shell, BP, Chevron and Total have been long-time customers of OSIsoft, the company behind the PI System – the world's leading software platform for managing real-time operational data.

The PI System allows its users to collect and centrally manage all operational information from traditional process control networks, IoT devices, proprietary data historians or cloud-based SaaS offerings. With the PI System, real-time data can be visualised, analysed and sent to executives for decision making and reporting. It can also be shared with third parties to enhance operations or streamed into any of the 'Big Data' analytics platforms to deliver predictive insights.

As the industry adjusts to the new "less for longer" oil price era, OSIsoft's customers are becoming increasingly open about sharing the success of their digital journeys and collaborating more closely on data-driven projects, an unusual trend for a sector that is usually tight-lipped about its technologies.

At the 2017 OSIsoft User Conference in London, customers like Shell, Petronas, Veolia, Transocean, ADNOC Onshore, and many others discussed their real-time data strategies and shared the latest developments in the world of the PI System. Here's the first of a two-part series of articles based on the success of OSIsoft's customers who have converted potential data swamps into game-changing intelligence, improved their operations and saved millions of dollars in costs. ◆

These drivers are making oil and gas operators focus on designing a centralised strategy for managing their operational data
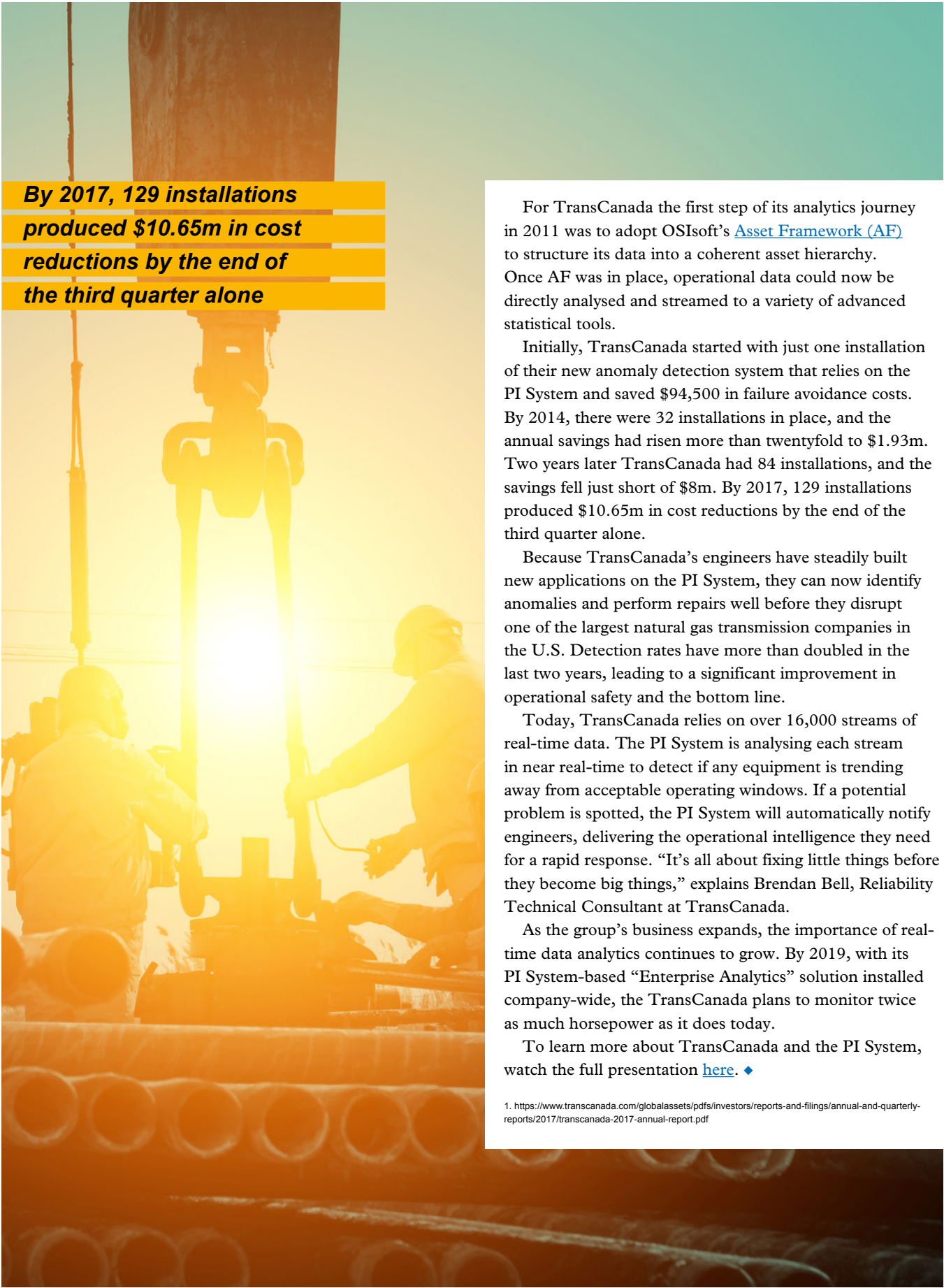
Keeping problems contained: how TransCanada minimises disruption

Before TransCanada embarked on a company-wide program of real-time data analytics a few years ago, the group was vulnerable to unexpected equipment failures and network outages. With high power turbines running 24 hours a day and 57,100 miles of pipelines[1] connected to high-demand markets, such vulnerabilities were hardly surprising.

According to Keary Rogers, the Systems Reliability Manager at TransCanada, an unnoticed broken valve plate or a cracked bearing on a tier-one piece of equipment could have easily triggered a crisis.

TransCanada first installed the PI System in 1998, but only used it for network monitoring and after-event investigations to determine the cause of a failure: a reactive rather than a proactive approach. However, after a particularly big incident in 2010 and a narrow avoidance of a second incident, the group signed a full-scale Enterprise Agreement (EA) with OSIsoft to accelerate their digital transformation and forestall further problems.

By 2017, 129 installations produced $10.65m in cost reductions by the end of the third quarter alone

For TransCanada the first step of its analytics journey in 2011 was to adopt OSIsoft's Asset Framework (AF) to structure its data into a coherent asset hierarchy. Once AF was in place, operational data could now be directly analysed and streamed to a variety of advanced statistical tools.

Initially, TransCanada started with just one installation of their new anomaly detection system that relies on the PI System and saved $94,500 in failure avoidance costs. By 2014, there were 32 installations in place, and the annual savings had risen more than twentyfold to $1.93m. Two years later TransCanada had 84 installations, and the savings fell just short of $8m. By 2017, 129 installations produced $10.65m in cost reductions by the end of the third quarter alone.

Because TransCanada's engineers have steadily built new applications on the PI System, they can now identify anomalies and perform repairs well before they disrupt one of the largest natural gas transmission companies in the U.S. Detection rates have more than doubled in the last two years, leading to a significant improvement in operational safety and the bottom line.

Today, TransCanada relies on over 16,000 streams of real-time data. The PI System is analysing each stream in near real-time to detect if any equipment is trending away from acceptable operating windows. If a potential problem is spotted, the PI System will automatically notify engineers, delivering the operational intelligence they need for a rapid response. "It's all about fixing little things before they become big things," explains Brendan Bell, Reliability Technical Consultant at TransCanada.

As the group's business expands, the importance of real-time data analytics continues to grow. By 2019, with its PI System-based "Enterprise Analytics" solution installed company-wide, the TransCanada plans to monitor twice as much horsepower as it does today.

To learn more about TransCanada and the PI System, watch the full presentation here. ◆

1. https://www.transcanada.com/globalassets/pdfs/investors/reports-and-filings/annual-and-quarterly-reports/2017/transcanada-2017-annual-report.pdf

PETRONAS

Petronas goes it alone in the pursuit of data quality

In mid-2015 Petronas' maintenance department had a data deficiency problem.

The maintenance and engineering team oversaw 130 pieces of aging, hard-working gas turbine-driven equipment, but had no accurate means for measuring its performance and reliability. The fact that the equipment had been supplied by several manufacturers made the job more challenging. Crews used hand-held data loggers to collect data about vibration, lubrication and other key asset benchmarks and manually compiled the data into monthly reports.

One possible solution for automating operational data collection was a real-time condition-based monitoring service offered by the original equipment manufacturers. The cost of such solutions, however, were substantial, and Petronas

was concerned about the potential issues of data visibility and ownership. Instead, the Malaysian energy giant decided to examine alternatives. Two years later, Petronas built and deployed its Protean solution, which relies on the PI System.

A Tentative Beginning

With Protean as its new solution, Petronas cautiously embarked on its digital journey. Initially, the maintenance team developed a monitoring system for just two critical gas turbine-driven compressor units. The team adopted OSIsoft's Asset Framework (AF) to build standard equipment templates for modelling all of the compressors, regardless of manufacturer. The AF templates structured and analysed data across the entire compressor fleet and allowed for rapid

deployment of Protean on any new piece of equipment. Crews used PI Coresight[1] to create and view web-based visualisations on any device.

At first, Petronas focused on a small number of critical sensors on its equipment. "Not all algorithms are required on all data points," points out Gavin Halls, Petronas' specialist in rotating machinery.
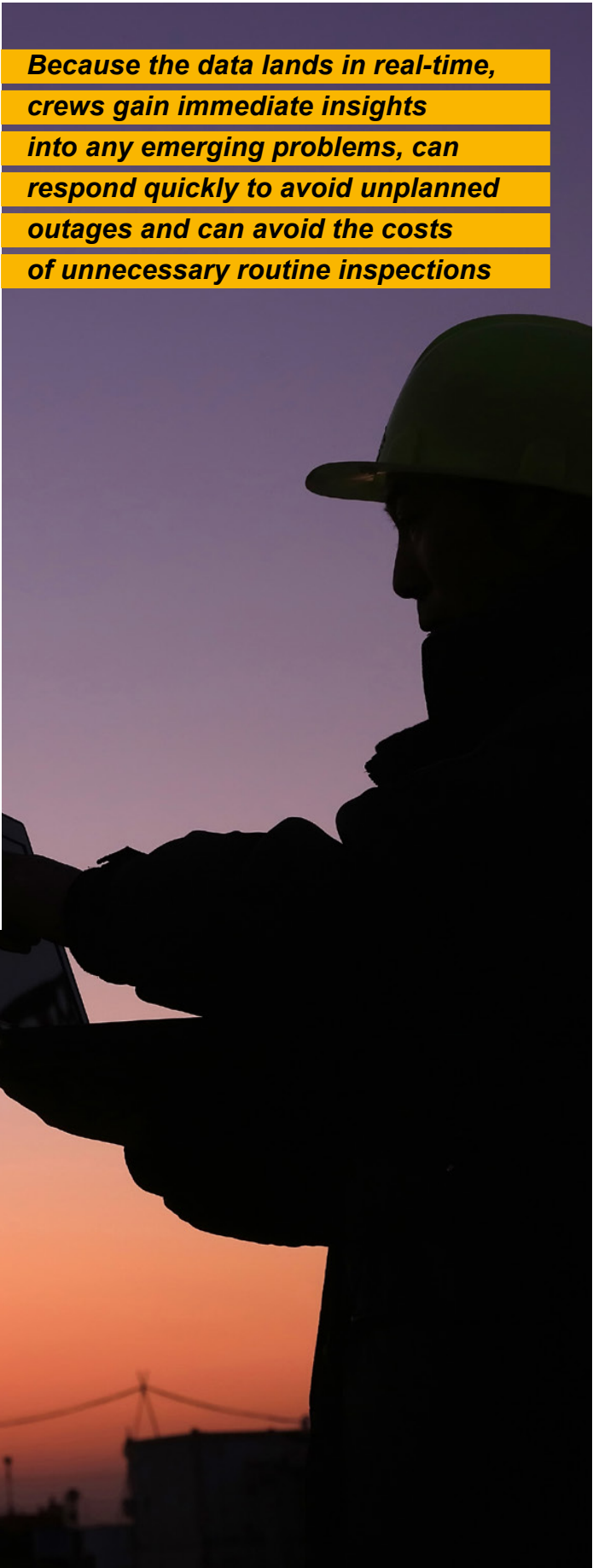
Within two months of its pilot, Petronas knew it was on the right track. Using real-time monitoring, engineers were alerted via email notifications about potential problems well before they occurred.

By mid-2017, Petronas achieved savings in excess of $1m through predictive maintenance and was confident enough to push the program deeper into its portfolio of high-value rotating equipment. By the end of the year, the system had been installed on 32 units. The company is now planning to incorporate more than 100 other assets into its Protean solution by 2019.

For Petronas, the use of real-time data within its maintenance department has led to a new, more effective philosophy. Instead of conducting maintenance at fixed periods as before, maintenance is now scheduled based on data analytics. Because data lands in real-time, crews gain immediate insights into emerging problems and respond quickly to avoid unplanned outages and unnecessary inspections. For Petronas, data-driven maintenance has become one of the bedrocks of its reliability and operational excellence.

To learn more about Petronas and the PI System, watch the full presentation here. ◆

1. PI Coresight has been renamed to PI Vision in 2017.

Because the data lands in real-time, crews gain immediate insights into any emerging problems, can respond quickly to avoid unplanned outages and can avoid the costs of unnecessary routine inspections

ADNOC Onshore marries PI System with IBM Maximo

As one of the world's leading energy companies producing around 3m barrels of oil and over 9bn cubic feet of gas a day, the Abu Dhabi National Oil Company (ADNOC) requires its infrastructure to function without a glitch.

A few years ago, ADNOC Onshore, the subsidiary responsible for all land-based operations in Abu Dhabi, became increasingly concerned that it lacked the insights it needed into the reliability and integrity of its most critical equipment. ADNOC Onshore was ready to deploy digital solutions and adopt a proactive strategy to intelligent maintenance and repair practices. The company was already using the PI System for production optimisation, terminal operations and energy management. The next step was to utilise OSIsoft's real-time technology to create a condition-based maintenance system for its fleet of equipment.

For a long time, ADNOC Onshore had been assessing the reliability of its equipment by a time-consuming and error-prone method of manually tracking run hours and status. KPIs for management were then calculated from the data using spreadsheets. Now, the company wanted to use the PI System to identify root cause of shutdowns, recognise behaviour patterns in future operations and avoid outages before they occurred.

The first step to achieving automated equipment monitoring was to deploy OSIsoft's Asset Framework (AF) to structure the company's PI System data and create notifications for critical operating events, such as breakdowns or malfunctions.

To build a new solution, ADNOC Onshore combined its IBM Maximo maintenance system with the PI System. The new solution can monitor equipment in real time and offers

a platform through which critical events can be annotated by engineers. The PI System calculates KPIs and provides dashboards and reports. In the event of a stoppage, the PI System sends alerts to users and works with IBM Maximo to automate the creation of work instructions or check when a piece of equipment was last serviced.

The solution provides 24/7 monitoring of critical asset components – rotors, bearings, seals, fans and coolers – and delivers valuable time-saving data, such as the probable effect of a malfunction, the proposed solution and the availability of spare parts. Individual links to live data in PI Vision displays are created for every asset whenever an email alert is generated. Using its built-in escalation matrix, the system sends the information progressively higher up the organisation if engineers aren't responding promptly to warnings.

With the first phase of its digital transformation in place, ADNOC Onshore is now extending its intelligent maintenance practices and "smart" notifications to more types of equipment and continues to gain greater insights into the machinery that keeps its oil and gas flowing.

To learn more about ADNOC Onshore and the PI System, watch the full presentation here. ◆

The solution provides 24/7 monitoring of critical asset components and delivers valuable time-saving data

Conclusion

In the second part of this story, Shell, Transocean and SBM Offshore explain how they are achieving transformational gains from operational data using the PI System.

Shell explains how they use PI System data and advanced analytics to monitor harmful emissions from underground gas storage. Transocean talks about their Deepwater 4.0 Digital Transformation and how it aims to make full use of all their real-time drilling data. SBM Offshore discusses how a new data sharing partnership with Veolia is leading to dramatic improvements in the way they manage critical water injection equipment on their large fleet of FPSOs.

Look out for part 2 of this story in April. ◆

Read part two about how Shell, Transocean & SBM Offshore are achieving similarly transformational gains from data in their own PI Systems