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THEIA

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**WEBINAR // The Tide is Turning: The Role of
Digitalisation in the Pipeline Integrity Industry**

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DATA MANAGEMENT IN THE CLOUD

Sue Evans, on behalf of Penspen, UK, explains how a new cloud-based pipeline integrity management solution could help pipeline operators reduce risk across their assets.



This month sees the launch of THEIA, Penspen's cloud-based pipeline integrity management solution, developed to empower operators and, amongst other things, free them from the hitherto onerous data gathering, assessment and reporting cycles. Penspen CEO Peter O'Sullivan explains, "Essentially, we're transforming our integrity business model to counter the extreme challenges we face as an industry. By doing so, we also aim to enable clients to adopt a more responsive, flexible approach to integrity management and risk assessment."

With oil prices reaching record lows during the coronavirus pandemic, one could be forgiven for questioning whether changing the way you do business is wise in the current climate. For O'Sullivan, not only is

Penspen's strategy wise, it is essential for the long-term prospects of the energy industry, if it is to deliver greater efficiency and cost effectiveness, as well as to meet safety standards. THEIA is the culmination of Penspen's digital transformation programme, providing an automated platform for pipeline integrity management, analysis and prognosis based on the engineering consultancy's many decades of experience.

The quadrilemma

Recent fluctuations in energy prices and the stalling of new investment may have grabbed the headlines, but there is a wider malaise affecting the industry.¹ Penspen Executive Vice President Technical Excellence, Nigel Curson, dubs

this the quadrilemma: a quadruple headache that makes the case for developing a digital platform like THEIA all the more compelling. Curson maintains each of these four headaches is a contributory factor towards pipeline failures, which are on the increase.

- Ageing assets and increased risk.
- Scarce resources, including a shortage of people with the necessary skills.
- More regulation, resulting in increased workloads.
- Financial restraints, lack of investment, decreasing budgets and downward pressure on operating costs.

Together these four headaches suggest the previously tried and tested methodologies for pipeline integrity have to change. As an industry, we need to think differently. Embarking on a new initiative in response, Penspen has transferred its traditional methodology onto a digital platform and automated it. The result is THEIA, a suite of analytical tools and management dashboards, designed to streamline maintenance, improve safety and productivity, and reduce costs. Curson argues that “the quadrilemma facing the energy industry cannot easily be resolved working under a typical contractual arrangement, and working for a lump sum price, following a drawn-out procurement process. Operators need a more dynamic, responsive relationship with their supply-chain partners to address the challenges presented by the quadrilemma.”

Given declining resources and revenues, and increasing regulation, pipeline integrity management needs to be more adaptable, if it is to make a meaningful contribution at critical junctures during a pipeline’s life.

The impetus behind THEIA

Managing rapidly expanding datasets and achieving Industry 4.0 compatibility drove the development of THEIA, with its automated data ingestion, verification, analysis and reporting to give fast results – in most cases, in under one minute.

Advancements to inline inspection tool technology, sensors and connectivity, while welcome, have resulted in an ever-increasing flow of data and, consequently, more time required for analysis using traditional methods but with fewer people to do it.

By digitising Penspen’s core integrity expertise, THEIA builds on the consultancy’s earlier pioneering work. O’Sullivan says, “We have a lot of intellectual capital relating to the methodologies and algorithms that our engineers use, which can quite easily be made available via a digital cloud-based platform, and this kind of environment also lends itself very well to automation.” Improved data management and formats for data transfer are crucial for the efficient assessment and resolution of defects and deterioration, and alerting operators to the appropriate action to reduce the risk of failure. THEIA is a

shift towards adopting a Pipeline 4.0 philosophy when it comes to engineering assessment and analytics.²

In effect, THEIA empowers operators to do their own inspection analyses, as well as other complex tasks. Penspen’s integrity engineers will continue to provide client support wherever it may be required, but focus on more complex and case-specific consulting.

O’Sullivan maintains, “THEIA may be digitally transforming what we do at Penspen, but it also has the potential to help clients on their own digitalisation journeys, opening up new possibilities to improve productivity and agility. Indeed, we are bringing a disruptive technology to the market that will require us all to rethink how pipeline integrity is managed.”

Fast data alignment

An important aspect of managing pipeline risk is recognising we are dealing with a dynamic environment, with external conditions, such as terrain, construction, population and constantly changing weather. This potentially involves huge quantities of data that ideally requires continuous processing and reporting to enable timely action.

THEIA automates the analysis of multiple data sets, combining them on a common platform for more precise insights and prognoses. Many of the problems facing operators are complex and intractable, such as how long an asset will last; determining the best way to maximise longevity; and how assets should be maintained or repaired. Solutions to these problems require an iterative and inductive approach which THEIA can provide.

Typically, operators have inspection data across several years from different vendors, using different tools in different formats. THEIA can accurately match the data to show where anomalies have formed and grown over time, and predict how they are likely to grow in the future. Cumulatively, these analyses feed into strategies for maximising the remaining life of a pipeline, optimising repair or replacement programmes, and identifying the need for down-rating or rehabilitation. An additional benefit is that operators will have more freedom to select different ILI vendors, knowing that with THEIA inspection data can be seamlessly aligned.

THEIA can also provide insights derived from the integration of disparate datasets, for example by combining corrosion data with environmental data, including population densities, terrain models and weather data, to identify where coating failures or other damage may have impaired the integrity of the pipeline. Other failure models can be related to the proximity of powerlines, rivers and railway tracks, as well as other pipelines. Again, THEIA can integrate this type of external data with sensor, inspection and environmental data to give greater insights into managing risk.

Trusting in the cloud

In developing THEIA, Penspen worked alongside technology partner QiO, who are experts in building cloud native platforms for industrial clients including FTSE 100 companies. Because

of QiO's expertise in cloud technologies, THEIA has machine learning built in and is Industry 4.0 ready with the functionality to analyse live sensor data.

For those unsure about cloud computing, leading technology analyst Gartner predicts half of global enterprises using the cloud today will have adopted an all-in cloud strategy by 2021, even if that means using external sources of cloud infrastructure.³

Cloud delivery allows for the incremental but rapid deployment of advanced software tools, giving access to intuitive applications for the workplace with a similar look and feel as consumer apps, which previously has not been the case.

With so much sensitive data involved, it is vital that users are reassured about secure access. Clients can be confident THEIA incorporates the following three cyber-security criteria:

- QiO's platform and THEIA are ISO 270001 accredited. The developer has been externally audited, its security policies and compliance scrutinised and verified. Certification to this international best practice standard means clients accessing a cloud platform developed by QiO, like THEIA, can be assured their sensitive data will be securely managed and not susceptible to cybercrime, software attacks or sabotage. Data protection is essential for any business and a legal imperative.
- Security has been built into THEIA's cloud architecture from the beginning. This is important because security architecture cannot be retro-fitted.
- QiO's platform has undergone stringent penetration testing and independent testing of its cloud services for vulnerabilities, subjecting the multi-layered security measures that have been put in place to exacting scrutiny. For industrial clients of cloud computing services, it is crucial they are fully aware of penetration test results from any potential provider.

Security can sometimes be seen as a hurdle to a project, but this can be overcome by building trust, inclusiveness and collaboration into digital programmes. O'Sullivan suggests, "Clients should consider THEIA an extension of their workforce, a new way to empower their integrity teams and capture the value of their data." As QiO would have it, "We put the PhD into the application so you don't need a PhD to run the application."

What clients can expect using THEIA

Operators can use THEIA to explore various options for their pipelines in real-time, rather than having to wait months for the inspection process to run its course.

Engineers upload their data directly onto THEIA and then compare the resulting analysis with previous data runs to assess the rate of change, which for example could be for bending strain caused by land slippage, or for the development of corrosion features. Such aggregations and comparisons are difficult using conventional methods but are much more straightforward with THEIA's integrated

cloud-based platform. Combining different data sets enables users to achieve greater insights into the state of the pipeline, how the landscape is changing around it and, consequently, what preventive action to take and when to take it.


THEIA is completely intuitive. Engineers can log on from anywhere in the world, as long as there is internet access, upload their data and quickly see the results. As new services are brought online, the software is automatically updated without the need to reinstall or reconfigure the platform. An advantage of THEIA is that clients only need subscribe to the services they require, rather than purchasing a full software package requiring hardware and maintenance, and which may not be fully utilised over time.

What next?

Entering a new decade, pipeline engineers are poised with an eye on future opportunities, whilst at the same time seeking to consolidate the certainties of the past. THEIA provides a bridge between the two by leveraging new technologies, machine learning and AI, alongside existing assets and data, to reduce risk for pipeline operators worldwide.

For now, THEIA's focus is pipeline integrity management within a Pipeline 4.0 philosophy. As O'Sullivan explains, "Our reputation for pipeline enterprise risk assessment goes back more than 60 years. Focusing on integrity management for the initial release of THEIA seemed the obvious way for us to leverage that knowledge." With better algorithms and methodologies, THEIA can deal with complex real-time data to offer a reliable and practical prognosis, and the prompt assessment of failure probability. The business case for THEIA is the potential value it can create through better data management, improved visibility and management of risk, and the optimisation of a pipeline's remaining life.

Penspen has a bigger vision for THEIA looking ahead. O'Sullivan says, "THEIA is our digital platform for engineering analytics and services, initially focused on pipelines but our longer-term intention is to include a broader array of assets both upstream and downstream from these."

THEIA promises to take care of a lot of routine integrity management tasks, allowing pipeline engineers time to do more in-depth and holistic analyses of their networks. For engineers in our sector, skillsets involving digital expertise, data science and coding, will become ever more important and enable them to increase the value they create for their enterprises. Penspen believes THEIA will be a significant catalyst for such a change. 

References

1. The International Energy Agency estimates global investment in energy will fall by 20% or a record US\$400 billion during 2020. <https://www.iea.org/reports/world-energy-investment-2020>
2. Penspen refers to Pipeline 4.0 philosophy to denote the future application of Industry 4.0 strategies to pipeline operations.
3. <https://www.gartner.com/smarterwithgartner/cloud-computing-enters-its-second-decade/>

A day in the life of Raheel, a Pipeline Engineer...



THEIA works for Raheel, see how it can work for you

See Raheel's story at www.penspen.com

Advancements in In-Line Inspection (ILI) tool technology, while welcome, have resulted in an ever-increasing flow of data and, consequently, more time required for analysis. With THEIA, you can expect an up-to-date analysis of the health of your pipelines. From data upload to generating the resulting reports takes a matter of minutes, with the alignment and correlation of inspection data from any vendor fully automated.

Empower your integrity team with THEIA, your complete integrity management solution.

Join us for our webinar to find out more about THEIA's role in the pipeline integrity industry.

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