Digitalisation of the pipeline lifecycle

Raul Lema, Technical Toolboxes, USA, and Brad Raabis, Metegrity, Canada, describe a new working platform that will both manage valuable pipeline data and generate actionable information.

T he pipeline lifecycle can be defined by four key phases: design, construction, operations and integrity. The underlying catalyst for success in each of these phases is the speed in which owner operators can gather accurate, actionable intelligence on their assets and deliver bottom line results that impact the operational cost and revenue of their business. Complex pipeline engineering calculations are needed at every stage.

Figure 1. Digital data capture and standardised engineering calculations at the inspector's fingertips can be used to reduce the risk of failures in the future.

In the current climate, too many pipeline owner operators are relying on outdated methods to curate and analyse the information they need to drive bottom line results. Relying on spreadsheets, physical reports, paper processes and manual calculations, they face significant hurdles when trying to acquire actionable data during pipeline construction. These challenges are compounded over the long-term integrity of the asset's life. An excessive amount of engineering and man-hours are required to garner any actionable information. This impedes construction efficiency, progress and overall quality – raising the potential for lost profitability, or worse, asset failure.
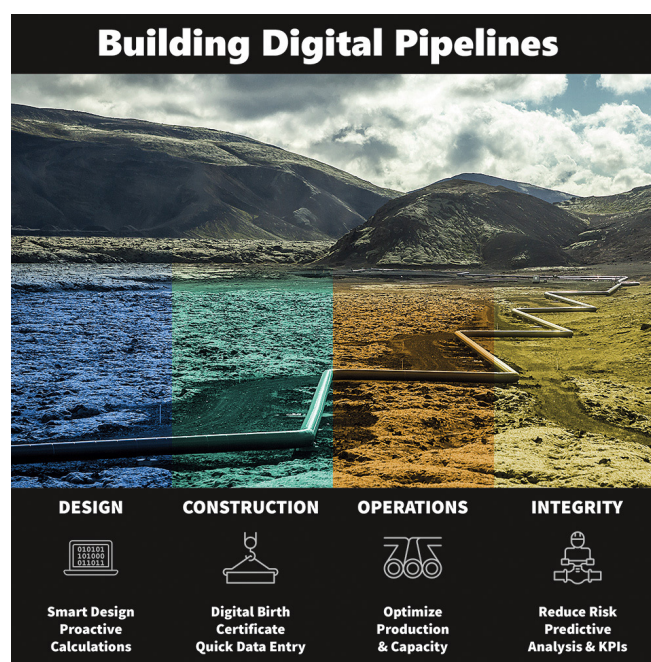

Figure 2. True value can be realised in each stage of the pipeline lifecycle when information can be quickly processed, driving key decisions that improve asset efficiencies and reduce asset risks and costs.

Figure 3. Empowering inspectors with the latest technology improves project data capture, efficiency and reliability from the field to the boardroom.

The solution

To address these industry challenges, pipeline software service providers Technical Toolboxes (TT) and Metegrity are combining forces. They recognise a need for new technological innovation – specifically, a platform that not only manages valuable pipeline data but also generates actionable information, offering pipeline owner operators full digitalisation of processes.

Each company brings technology to the table that solves portions of this digitalisation equation. With Pipeline Toolbox from TT, more than 230 different pipeline-specific engineering calculations are automated. With Pipeline Enterprise from Metegrity, the data needed to perform those calculations is collected automatically in real-time and curated onto a single, robust platform. TT can then utilise that data to auto fill values required to determine actionable business intelligence on the pipeline. Together, each of the two services completes the other for full digitalisation. Together, they represent an innovation in pipeline quality management technology.

The ability to fully digitalise processes along all four phases of the pipeline lifecycle translates into a substantially reduced likelihood of asset failure, considerable increase in profitability and increased efficiency and accuracy during projects.

Methodology

With these combined services, standardised calculations can be delivered to field personnel right at the work face to drive quicker decisions on construction-related issues. This reduces the overhead required to gather data from files and paper-based long-term record systems to complete calculations. It enables predictive capabilities when calculations are captured and analysed over time. This transition enables machine learning and artificial intelligence systems.

For an example of how this might work in real life scenarios, consider this: judging cover is required for an engineered crossing (if the crossing is outside of designed recommendations). On the fly, hydrotest filling requirements can be accessed by field personnel without requesting calculations from head office. Hydro horizontal directional drilling (HDD) pressure calculations would be standardised among all inspectors. This in turn would eliminate HDD inspectors having to manage conflicting calculating spreadsheets. Average frac-outs can cost up to US$3 - 4 million in clean up, fines and lost construction production. By digitalising all processes and data collection, the combined pipeline offering from TT and Metegrity helps avoid millions of dollars of expenditure while radically improving the efficiency and accuracy of the project.

Further down the phases of the pipeline lifecycle, this combined offering will substantially improve pipeline integrity management. Pipeline integrity models can be fed with relational database values that normally would have to be extracted through manual processes at engineering rates. Being able to access this data (and pertinent calculation) will provide the foundation for new models of pipeline degradation that are more quantifiable than anecdotal. This can increase maximum operating pressures that are defined by regulators. Ultimately, this will improve understanding and reduce catastrophic events in pipeline health and operations.

The design phase is both the starting point of any project and the impetus of all future development. Future pipeline design will benefit from improved understanding of pipeline health and integrity models derived from this partnership. New digital insight will be gained and provide potential benefits that cannot yet be quantified. Innovation begets innovation, and the sheer increase in actionable intelligence will facilitate a myriad of uses and benefits. In turn, new methods will be engineered to capitalise on this new partnership and industry solution.

Expanding potential for pipeline digitalisation

Metegrity delivers data capture and creation of a digital twin with thousands of data points in a relational database. TT's Pipeline Toolbox is a vast calculation engine with more than 230 standard calculations that address the pipeline lifecycle; design, construction, operations and integrity. By combining the services, TT's Pipeline Toolbox facilitates the calculation of actionable tasks, while Metegrity's Pipeline Enterprise automates the data collection and entry required for those equations. Combined, both products create a new solution that will enable seamless integration of data points and calculations. This will deliver significant reduction in overhead costs incurred by midstream companies throughout the pipeline lifecycle. Reduction of these costs provides increased profitability of current and future pipelines and enhanced financial feasibility of future pipeline projects. Pipeline operators can expect immediate, tangible reductions in cost and increases to profitability. These include improvements to production, capacity, cost control, safety, risk management and overall efficiency.

The future of digitalisation

Pipeline companies around the world are all moving toward digitalising their processes. With increased competition from renewables and margins tightening, digitalisation of pipelines will be more competitive, driving cost and risk down and improving bottom line production and revenues. With the increased availability of digital technologies for the pipeline sector, it is more affordable than ever to invest. The return on investment is apparent during construction but more so over the 50 - 100 year lifecycle of the pipeline, when production, integrity and operational costs are scrutinised daily. WP