Digitizing Energy

Digital Innovation for Pipelines
Leveraging emerging technologies
to maximize value

By deploying available digital technologies, pipeline operators can realize breakthrough improvements in integrity, safety, compliance and operational efficiency.

High performance. Delivered.
To enable this growth, in what is already one of the world’s most intricate networks of oil and gas pipelines, multiple issues must be addressed—from aging assets at increasing risk of failure and increasing regulation, to a projected loss of 50 percent of the existing workforce through natural attrition.

In this environment, pipeline operators need to leverage emerging technologies to deliver major performance improvements and maximize value across their networks. By taking advantage of operations and information technology convergence to implement virtual pipeline assets, they will realize breakthrough improvements in integrity, safety, compliance and operational efficiency.

*Oil and Natural Gas Infrastructure Investments Will Be Boon to US GDP, Jobs, 7 January 2014, Penton Insight, IndustryWeek, © 2014 Penton Business Media. All rights reserved.

The "digital pipeline" opportunity

Accenture defines the “digital pipeline” as information convergence in a cloud-based environment, with new technologies being added to provide near real-time visibility into the condition and risk profile of assets, and workforce enablement via remote collaboration tools.

We are already seeing oil and gas pipeline operators investing heavily in new technologies for better control, inspection and maintenance of assets. The future will see deployment of emerging technologies, such as:

- Digital convergence of data from asset registers, geographic information systems (GIS) platforms, risk modeling and management, supervisory control and data acquisition (SCADA) and real-time data historians, operator qualifications, global positioning system (GPS) data and workflow management.

- Big data analytics to identify otherwise unrecognizable trends and conditions, enabling safety, risk, operational and commercial optimization.

- Wearable computer devices, such as Epson Moverio and Google Glass, that provide on-site visualization of maintenance information, asset detail and 3-D images for seamless collaboration with experts at offsite locations—all providing faster problem resolution and helping pipeline operators to be more effective with limited resources.

- Industrial automation security to protect critical infrastructure from cyber threats.

- Innovative leak detection tools that use robotics, fiber optics, acoustic sensors and satellite monitoring to increase the chance of preventing an incident or minimizing its impact by combining detection capabilities with perimeter surveillance and right-of-way monitoring.

- Ruggedized portable devices that enable safer and more efficient operations by providing immediate access, in the field, to process data, safety procedures and form templates.

- Lightweight unmanned aerial vehicles (UAVs) that can monitor remote areas for leaks and encroachments, improving personnel safety and expediting identification of locations requiring repair or remediation.
The Accenture Life Safety Solution
Transforming work safety

Drawing on the combined capabilities and experience of Accenture, AeroScout Industrial, Cisco and Industrial Scientific, the Accenture Life Safety Solution (ALSS) provides a comprehensive approach to safety.

Employees wear a multi-gas detector and if abnormal levels of gas are detected, the device immediately alerts the employee and simultaneously transmits the gas-level information and personnel location over a wireless infrastructure to a control room that continuously monitors abnormal condition alarms. The ALSS software indicates a separate alert if the individual either activates the panic button or exhibits lack of motion (man-down). Until recently, wireless networks have been unable to provide reliable coverage, limiting the ability to determine an individual’s exact location. The ALSS now makes this possible based on an actual facility-wide deployment.
A day in the life of a digital pipeline operator

Let’s take a look at how these digital technologies can be deployed in everyday pipeline operations. At a pipeline control center, an operator is beginning the shift by logging into the integrated network management environment using a fingerprint scanner.

1. The operations dashboard shows key performance indicators, such as fuel consumption and throughput efficiency, as well as the day’s scheduled work orders and the current risk profile.

2. Elsewhere in the facility, a maintenance manager looks at a GIS map to see colorized risk locations that guide inspections, recent SCADA alerts, current crew locations and the day’s planned work orders.

Generated by analytics, a proactive maintenance suggestion arrives recommending recalibration of a drifting pressure transmitter. The manager decides to issue a work order in response.

In the back office, an intelligent work order assignment tool identifies the optimal crew to execute the order, taking into consideration operator qualifications, location of other nearby work and personnel availability.

6. The head-mounted displays show details of the asset to the crew members. Step-by-step guidance is provided, along with instant communication links to off-site experts.

7. The crew completes the repair and closes out the work order in a tablet-based template, automatically populated with the GPS coordinates and asset information. The site is automatically added to the visual inspection list for follow-up monitoring by subsequent UAV flights.

Using the situational awareness tools, the operator obtains a list of key community response parties to be notified, such as the local police and fire department, along with their contact details and pre-filled incident report. The operator triggers an automatic workflow of notifications and initiates the US Pipeline and Hazardous Materials Safety Administration and Department of Transport defined actions.
5. Once the UAV mission analytics confirms a leak, the operator triggers the automated command sequence to isolate the leaking sub-network. The UAV hovers over the leak location until the sensor detects that the level of hydrocarbons in the air has decreased, and it is now acceptable for a manned mission.

The operator identifies the nearest crew on the geospatial view. It is the same crew that was sent to calibrate the drifting instrument. They receive a high-priority alert with the information needed to address the suspected leak and head straight to the location. On the way there, a team member reviews the safety and compliance guidance relevant for this type of incident and drafts a job safety analysis from the standard template provided on a ruggedized mobile device.

On arrival, the crew activates the ALSS, which monitors for hazardous atmosphere, man-down and location.

4. The operator in the control room receives an alarm, generated by the fiber optics leak detection system.

This has identified a suspicious thermal change suggesting a possible leak. Situational awareness tools provide an instant view, confirming that there is no planned work being conducted at this specific location, and that there are no relevant reports from the one-call system. The operator immediately initiates the dispatch of a UAV from the nearest launcher to check the problem location, pinpointed to the nearest foot. The visual, thermal and hydrocarbon content information is transmitted in real time back to the office for analysis and geospatially presented on the operator’s dashboard.

3. The maintenance crew travels to the designated location, using mobile field operations tools (such as ruggedized iPads) to review en route the work order details.

The crew receives background information about work performed historically at the same location, photos of the previous repair, last known pipeline condition and comments left by other work crews.
Delivering results

This scenario demonstrates the tremendous opportunities that can stem from the convergence of operations and information technologies:

Safer working environment
Using wearable safety devices and innovative leak detection tools for better monitoring and improved risk mitigation.

Reduced operating costs
Using advanced network modeling, automation of business functions and proactive maintenance techniques to fine tune the operation of a pipeline network to maximize throughput, limit maintenance costs and save energy.

Expert knowledge retention
Using social collaboration to instantly store, search and transfer skills, experience and knowledge.

Leading-edge technologies that can deliver these outcomes are already available and being applied by companies in other industry sectors—as illustrated by the Taleris example (see sidebar). By integrating these technologies with their people and processes, pipeline operators will realize the full benefit of applying both information technology and operations technology, significantly boosting the efficiency, productiveness and safety of their networks.
Taleris
Taking asset maintenance to the next level

The convergence of operations technology (OT) and IT is improving maintenance, enabling remote monitoring of equipment and planned (rather than unexpected) shutdowns. Companies in other asset-intensive industries are achieving substantial results from advanced predictive analytics. In the airline industry, for example, protracted delays undermine profitability, and analytic-powered solutions enable companies to recover faster and improve maintenance to avoid equipment breakdowns. New technologies, such as those from Taleris, a GE-Accenture joint venture, enable scanning of data on parts, components and systems. The technology brings together multiple sensor data from "tip to tail" for centralized analytics and warns of imminent problems.
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