

# Asset Performance for **Oil and Gas**

Advancing asset performance to deliver safe, reliable,  
compliant, and cost-effective service

**Bentley**<sup>®</sup>  
*Advancing* Infrastructure



# Accelerate Your Digital Advancement with AssetWise

Every challenge you face has a digital component. To gain better insights into your data and make the best business decisions, use AssetWise CONNECT Edition to deliver your digital advancement.

## Achieve Operational Excellence with AssetWise

The oil and gas community strives for efficiency, innovation, and keeping costs low to achieve operational excellence. Now, more than ever, oil and gas operators need a solution to help them achieve these goals. Bentley's AssetWise solutions for the oil and gas industry deliver services that will aid it in becoming efficient in reliability, safety, risk, information management, and operational performance throughout the lifecycle of its production and refining assets.

## How Far Along Are You Toward the Digital Oil Field and Plant?

- Where are your assets and where is your organization on the digital maturity curve?
- Is your information presented in context and managed through the lifecycle of change?
- Is your information accessible, trustworthy, comprehensive, and available in real time?
- Do your information technology (IT), operational technology (OT), and engineering technology (ET) processes converge to deliver informed decision support?
- Do you have the data you need to plan and proactively manage inspection and maintenance strategies?
- Are your dashboards and reports easily configurable so you can view the KPIs you need most?
- Are your enterprise technologies interoperable?

## Oil and Gas Companies Use AssetWise for:

- Operational efficiency
- Production optimization
- Collaboration
- Decision support
- Data integration
- Workflow automation

# Oil and Gas Trends

## Going Digital

Manufacturing companies are using digital information, new technology, such as drones, and "digital twins" of their assets to transform work processes and to create new, innovative business models. Until very recently, the oil and gas industry had been slower to incorporate new technology compared to other industries, instead focused on finding, developing, and selling products on a global scale. Now, energy operators are accelerating digitalization and moving to an entirely new business model by using technology to create a different model for competition. These original methodologies include developing and selling digital assets (e.g. algorithms and reality meshes), creating a digital industry platform, and leveraging the Industrial Internet of Things (IIoT). Upstream producers who are leveraging machine learning to interpret large datasets to increase oil recovery rates through the collaboration of engineering, business, maintenance, and operating teams is another example of an innovative solution. While some companies have not started going digital, the time to prepare for integrating digitalization is now because it will be critical to success.



## Digital Disruption

There is a perception that going fully digital will cause a certain amount of disruption as a result of organizational change, unfamiliar processes, and different procedures. Bentley's domain expertise, innovative technology, connectivity, enterprise interoperability, and the reuse of digital information significantly minimizes the digital transition. Solutions provided by AssetWise ensure seamless integration for continuous production, agility, performance, and intelligence.

## Asset Performance Management

Asset performance management, while having been around for a long time, is still not as widely adopted as it should be, especially when considering the financial consequences that equipment failure and downtime have, as well as loss of reputation. Asset performance management's core capabilities of data capture, integration, visualization, and analytics are brought together for the purpose of optimizing the performance of assets to increase availability, minimize costs, improve safety, and reduce operational risks.

## Asset Lifecycle Information Management (ALIM)

In operations, ALIM is often used to share information among applications for enterprise asset management (EAM), control systems, reliability, and predictive maintenance. Asset information lifecycle management enables asset-intensive organizations to optimize the returns from their substantial investments in equipment and facilities. Every oil and gas asset-intensive organization needs ALIM to provide its people with accurate and reliable asset information.

## Advanced Analytics and Machine Learning

Machine learning is creating a real buzz across all industries because of its potentially transformative predictive maintenance solution, one aspect that could radically revolutionize asset management. With AssetWise's machine learning technology, as well as other advanced analytics advances such as Neural Networks, the number of areas where new data science techniques can be applied is growing. As well as predictive maintenance, machine learning can also provide greater precision on oil location, video, and image interpretation to detect faults, and case-based reasoning to identify problems affecting current situations.

## Compliance and Continuing Cost Reductions

Recent lows and ongoing uncertainty regarding the price of oil has triggered an unprecedented wave of cost reductions in the industry. The oil price has now shown signs of stability, and many in the industry are identifying ways to deliver a sustainable business at these price levels. Unfortunately, in the same period, the level of scrutiny by governments, certification, insurance, and other organizations has also grown substantially when it comes to compliance. The quest for regulatory compliance is always ongoing and should be linked to accurate information and up-to-date reporting at all times to ensure efficiency and predictable performance.



## AssetWise Asset Lifecycle Information Management

### Complete Lifecycle Information Management

With information constantly changing on an asset, from location and maintenance to installation data, AssetWise provides an integrated information management environment that improves the quality, integrity, and relevance of asset data across all phases of the lifecycle. ALIM allows its users to manage documents and records, and view all associated information since creation, from a corrosion coupon to a tank, and link them so all relevant documentation is up-to-date, secure, and always available. With Asset Lifecycle Information Management, data will never be lost, misplaced, or unaligned, and it will become the most valuable asset you possess.

### Trusted Information When and Where It Is Needed

AssetWise provides structured control of asset and related engineering information, improving overall accessibility, quality, integrity, and

relevance of asset data across the asset lifecycle. ALIM services are supported by Bentley's unique connected asset visibility capabilities, allowing access to asset information from either a model-centric or data-centric point of view, and allowing you to work in an asset-centric environment.

### Spatially-Enabled Asset Information

AssetWise ALIM provides the ability to view and use information from a graphical perspective for spatially located assets and related information. It allows you to view information in a manner that can support enhanced decision making across different types of assets. Assets can be located based on spatial coordinates, on a position along a network, or in proximity to another asset. This network-based approach allows you to perform complex analysis across the entire organization and asset base, regardless of location.

design, construction, and operational documents and data at every stage of the asset lifecycle. These benefits facilitate faster project start-up, streamlined workflows, standards adherence, standardization, reduction of risk, and better-informed decisions. It ultimately results in increased asset performance. Interoperability is the cornerstone of Bentley's technology and the key to a successful asset information management solution. Information from AssetWise can be used in third-party systems, while information from one or more third-party systems can be leveraged within AssetWise via a single, managed interoperable connection.

## A Connected Data Environment Delivers Maximum Flexibility

As owner-operators move toward digitalization, Bentley's Connected Data Environment positions its users to maximize the benefits of their transformation. The value of data in isolation is limited, so how does it become true infrastructure intelligence? The answer is context provided by connections. The connected data environment augments Bentley and non-Bentley data with cloud services and context to remove the silos within the oil and gas industry and provide unprecedented opportunities for efficiencies and insights in an open and live environment. The connected data environment ensures the accuracy and availability of

## ALIM Features

**ASSET REGISTRY AND TAG MANAGEMENT** Operators have hundreds of thousands or millions of assets, equipment, structures, systems, and components that need to be managed, tracked, and maintained for ongoing operations. ALIM gives you the ability to manage assets and their configurations, including product and item baselines, snapshots, and serialized items, as well as persistence and change management of tags and physical items.

**SPATIAL NETWORK MANAGEMENT** Ensuring information about networks and associated assets is critical for effective decision making, especially when connecting upstream with downstream. ALIM provides a spatial environment to visually access information and act. It includes the ability to view all related assets and attributes together with other spatially located information. Maps with navigation capabilities allow you to perform business functions directly within the spatial interface. User-friendly graphical reporting capabilities enable users to query and report on data without any programming or geographic information system (GIS) knowledge.

**CHANGE MANAGEMENT** Change management cannot happen without the ability to create relationships between relevant information, which is key to identifying the impact or effects of change. ALIM gives you powerful features for varying levels of change management. The application also monitors the progress of a change request by providing status details for each information asset and revision history traces the lifecycle of applied modifications.

**CONFIGURATION MANAGEMENT** Configuration management ensures that asset configurations conform to their requirements. It provides the ability to identify and retain the context of information and its relationship to projects, processes, equipment, organizations, and users throughout their lifecycles. ALIM gives you information integrity and consistency through closed-loop change management.

**DOCUMENT CONTROL** Effective document control must blend four key functional areas: document control, change management, records management, and distribution. ALIM integrates this functionality to provide you with the ability to effectively, efficiently, and accurately capture, manage, control, retrieve, distribute, and archive all types of infrastructure asset information across a field or site, regardless of location.

**RECORDS MANAGEMENT** Effective records management provides evidence for transactions, compliance audits, legal discovery, and more. ALIM provides advanced file plan and disposition functionality, delivering a powerful records management system for complete lifecycle management of all corporate records, compliance, and associated information. ALIM helps you comply with your organization's corporate record-keeping policies to meet regulatory compliance and reduce the risks associated with audits and litigation.

**REQUIREMENTS MANAGEMENT** Requirements management is a continuous process critical to meeting design specifications, as well as ensuring operational and regulatory compliance. With ALIM, requirements information can be updated in real time, and information can be automatically propagated and accessible to your stakeholders everywhere it is needed.



# AssetWise Operational Analytics

## Operational Performance with Context, Clarity, and Confidence

AssetWise Operational Analytics displays your operation information in real time and provides insight for informed decision support by converging operational and IT data with digital engineering models for right-time predictions and actions for dynamic management of asset and operational performance.

### Full Visibility of Performance

Data is the lifeblood of any operation. Data on its own can only tell part of a story. Data without analytics is useless, and analytics without the right data is a waste of time and effort. Analytics are one of the largest areas of opportunity where digitalization can help transform oil and gas companies, yet most operators will not have sufficient maturity in analytics capabilities to realize its full value. AssetWise Operational Analytics provides a solution that captures operational information from multiple sources and platforms, such as chemical usage, corrosion data, flow assurance, and domain knowledge, and combines it with calculations and analytics to give users a holistic and up-to-date view of performance. Performance dashboards, reports, and KPIs give users the context, clarity, and confidence they need in making critical decisions.

### The Industrial Internet of Things

Data collection systems, such as Pi, Maximo, OPC, Modbus, and SAP, which collect data on production, corrosion, chemicals, and flow rates, can produce many gigabytes of data in a day. It is exacerbated by the Internet of Things (IoT), with more and more sensors going online and producing greater amounts of data that were previously unavailable. AssetWise efficiently stores, correlates, and visualizes this data for rapid access and analysis, enabling you to make more timely and accurate decisions.

### Chemical and Corrosion Management

Drilling for hydrocarbons and their subsequent production would be impossible without the use of chemicals within water injections, corrosion inhibitors, and cementing. The industry must keep within strict regulations because of the negative environmental impacts prompted by chemical spillages or failure through corrosion. Failing to meet these requirements results in large fines and increased operating costs. Without adequate chemical and corrosion management, drill pipe integrity and downhole capabilities will be diminished, resulting in unexpected downtime at great cost. Operational Analytics provides a solution that manages chemicals and corrosion during drilling and production to ensure compliance, safety, and cost efficiency, and improve overall operational control of chemical sampling and corrosion over a network.

### Business Benefits

An Operational Analytics chemical and corrosion management system, as well integrity and flow assurance, can lead to increased production and improved corrosion mitigation with expected availability to increase by 1 to 2 percent. Additionally, the ability to measure the effectiveness of chemical treatments and provide cost-cutting decisions can bring savings of around of 10 percent or more.



## Operational Analytics capabilities:

**CONDUCT ADVANCED PREDICTIVE ANALYTICS WITH MACHINE LEARNING** The machine learning and advanced analytics capabilities provide an extension to the analytical capabilities already within AssetWise, allowing you to do what you already do well, but do it better, faster, and smarter. Using algorithmic and modeling techniques, machine learning can identify patterns and trends in your data without being explicitly programmed, giving you the ability to be more proactive with equipment failure and maintenance strategies.

### VISUALISE PERFORMANCE WITH INTERACTIVE DASHBOARDS

Operational Analytics dashboards provide a visual representation of your information, allowing you to be kept up-to-date on what is going on within your operation at all times. Bring the data to life with a variety of dashboarding capabilities that enhance views of key performance indicators, reports, and real-time data.

**SOURCE DATA INTEGRATION** AssetWise brings together asset data from a variety of sources and categorizes the data by location and time. AssetWise includes a number of integration capabilities for importing files, linking to existing databases and web services to communicate with other systems.

**DATA SECURITY** Keeping your data secure is our top priority. Only your authorized users can access your data, which can be further restricted by role. Our expert team works around the clock to keep your data secure, allowing you to focus on the results.

**CONVERGE OPERATIONAL, IT, AND ENGINEERING DATA FOR DECISION SUPPORT** Improve decision-making capabilities by connecting operational technology (OT) and IT information with engineering technology (ET) to fully engage the digital acceleration process. OT and IT convergence is already starting to take place within industries to provide more visibility and insight about costs, risk, and performance. Incorporating engineering technologies, like reality meshes, brings even greater knowledge about the asset and how the design process is important throughout the asset lifecycle.

**LEVERAGE AMULET CALCULATION ENGINE TO TRANSFORM AND CREATE NEW DATA** The Amulet calculation engine is more than a scientific calculator. It creates more data from what already exists and transforms it into usable and reusable actionable information. Once data is collected, the flexible Amulet calculation and rules engine can perform complex data analytics using business rules, algorithms, alarms, and aggregation to provide even more insight into what your data is telling you.

### SCHEDULE AND CREATE KPI REPORTS AS AND WHEN REQUIRED

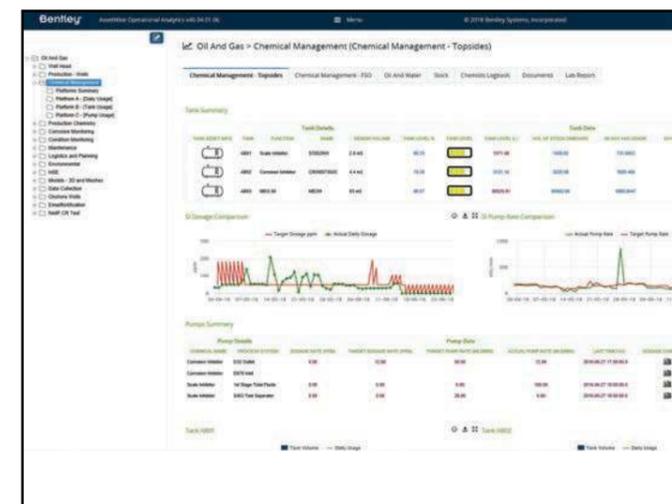
Create straightforward or complex reports directly from the dashboard and schedule them to be sent to anyone at any time. Simply select the dashboards you wish to view, select the period to display, and schedule the email recipients and delivery method. Based entirely on the dashboards, the reports can be grounded on KPIs, regulatory compliance, costs, production, alarms, and more.



Major oil producer saved **10 percent in chemical costs** through increased visibility.



Major oil operator increased **availability by 2 percent with Operational Analytics.**



Operational Analytics visually displays checks and trends for more intuitive decision support.

# AssetWise Asset Reliability

## Reduce Inspection and Maintenance Costs Without Compromising Safety or Reliability

AssetWise offers a fully integrated RBI and safety management program that ensures the safety and integrity of assets, such as pipeworks, pressure envelopes, and process systems. AssetWise is the complete asset management solution for oil, gas, and petrochemical, addressing both rotating and fixing assets in one single application. Used every day by maintenance and engineering operations, AssetWise's RBI program strengthens the asset care operation by instilling integrity, confidence, reliability, and asset performance management as a daily routine.

## Realizing Predictive Maintenance

Predictive maintenance is one of the key uses of machine learning in the oil and gas industry. In its simplest form, predictive maintenance is



Executive dashboards offer a graphical view of how the asset inventory is performing against metrics and goals.

a technique that will determine when a machine or piece of equipment will fail so that maintenance activity can be planned ahead of time and then carried out effectively. Falling under a variety of categories, predictive maintenance can be used for failure prediction, root cause analysis, failure detections, failure classification, as well as diagnosis and recommendations of maintenance actions and procedures. Machine learning can help bring reliable predictive maintenance insight through collection, storage, manipulation, algorithms, and analysis to produce a predictive model of equipment failure. By monitoring historical and near real-time data, such as sensor values and various other connected parameters, it can forecast potential asset failures with a high level of accuracy and probability. This capability allows proactive maintenance strategies to be put in place ahead of time to prevent needless unplanned downtime.



**Petroleum corporation saves 38% in maintenance labor hours while maintaining safety and integrity.**

## Full Inspection Management Suite

Inspection management enables owner-operators to maximize the use of asset inspection information for onsite/filed inspection, reporting, maintenance planning, project prioritization, and work scheduling. Quick access to all information allows organizations to turn needs into actionable plans. Risk-based inspections specialize in methodologies to maintain mechanical integrity of pressurized equipment and minimize the risk of loss of containment due to deterioration. Develop a risk prioritized inspection process enabled by AssetWise inspection data management system.

## AssetWise Supports and Drives a Proactive Reliability Process

AssetWise Asset Reliability is an asset reliability strategy, condition monitoring, and data consolidation platform. It enables you to efficiently and effectively collect, consolidate, and centrally store, analyze, and act on data to make timely and informed maintenance decisions. It mitigates risk and the consequences of failure, while at the same time lowering costs.

Bentley uniquely enables a reliability-centered approach early in the lifecycle to ensure operational readiness and optimal performance. Once in operation, detect the onset of failure early so you can make timely and informed maintenance decisions before equipment fails. AssetWise provides a unique combination of rigor, speed, and risk-sensitivity to develop a cohesive strategy across an entire equipment base. The application changes the way operations, engineering, and maintenance work together to manage oil and gas assets.

AssetWise becomes the "operation room" or pulse of the field or site as it relates to managing the condition of your assets and recommending what actions to take and when to prevent asset failure. AssetWise links directly back to the asset strategy program to continuously improve the living program and to help operators understand why actions must be taken.

## Longer Lasting Equipment with Technical Integrity

Safety analysis and management is a key element for any oil and gas producer. The ability to analyze loss of containment scenarios, identify and assess risks at system level and for related assets, and support processes to meet safety requirements and compliance make up the foundation of asset performance management. AssetWise Asset Reliability contains the methods and techniques that ensure assets are safely inspected and maintained to reduce or eliminate risk, including safety instrumented systems (SIS) and functions (SIF), safety integrity

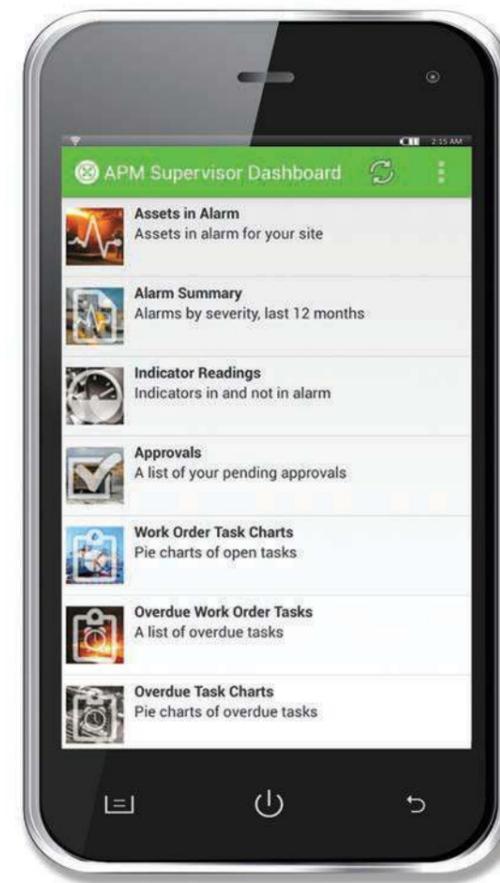


**Large terminal reaches 17M man hours without a serious injury or lost time during construction/operation.**

level (SIL), HAZOP, risk matrix, and Layer of Protection Analysis (LOPA), while supporting multiple safety standards including ISA 84, IEC 61511, IEC 61508, IEC 61882, and more. By having these procedures in place, users can improve the integrity of their assets and eliminate unexpected downtime, meet safety, quality, and operational targets, support regulatory compliance, and capture knowledge and experience of operators, maintainers, and engineers.

## Cloud or On-Premise Deployment

Quickly and effortlessly deploy AssetWise as a cloud-hosted managed service that includes installed capabilities that are configured and ready to use. No server hardware is required. Start with a few users and roll out to more users as data is populated. On-premise deployments are available with support plans to help drive success.



The mobile app allows all data to be collected in the field in disconnected mode and seamlessly sent to the server when a connection is available.

# Asset Reliability Features

**ASSET RELIABILITY STRATEGY DEVELOPMENT** Develop proactive strategies that improve long-term asset reliability and performance. Optimize processes for the day-to-day operations of assets to minimize operational costs and maximize your production capabilities. You can help develop high-quality reliability strategies and programs that ensure your oil and gas assets and asset investments deliver optimal value, maximize safety, and enhance regulatory compliance when you move to a risk-based approach to inspections and asset management.

**ASSET RELIABILITY PROGRAM MANAGEMENT** A documented and systematic reliability program that is technically sound and based on proven reliability strategy methodologies provides proof of regulatory compliance to prevent asset failure. Conduct root cause analyses and employ defect elimination methods, and then easily update the reliability program. AssetWise is a living program with continuous improvement built into the process.

**ASSET CONDITION MONITORING** Ensure a safe, reliable, and compliant operation. Asset Reliability provides a cohesive and integrated approach to implement and manage a living program to monitor asset condition and manage asset performance, integrity, and reliability. Track asset condition degradation and gain insight to make fast and accurate maintenance decisions. The application is certified and integrated with Infor, SAP EAM, IBM Maximo and Oracle EAM Enterprise Asset Management systems to trigger the right work on the right equipment at the right time.

**ASSET HEALTH MONITORING AND MANAGEMENT** Collect, consolidate, and analyze data from all asset condition inspections and real-time monitoring devices in one centralized asset health dashboard. Manage operational asset care processes, driving proactive inspections and corrective actions in time to prevent asset failure.

**DATA SCIENCE AND MACHINE LEARNING** Discover otherwise hard-to-see patterns or trends in your data and create more accurate predictive models that automatically adjust over time.

**IMMERSIVE VISUAL OPERATION** By leveraging Bentley's industry-leading asset performance management capabilities, its federated approach to information management, and its 30-year investment in design and engineering technologies, AssetWise is able to link 2D and 3D representations and models of a site with data from other operational systems to support common asset performance and integrity management process workflows. Achieve quick results and build momentum and support on your way to achieving operational excellence.

# Examples of How AssetWise Can Transform Any Operation

## Major Operator Saves Up to 10 Percent in Chemical Costs

A major operator in the oil and gas industry has taken advantage of the benefits from Bentley's chemical management solution delivered by AssetWise. By going from a lack of information and visibility on chemical usage and rising costs to having access to all aspects of chemical and production processes, the operator can now optimize and report on chemical usage across all areas for day-to-day performance and planned treatments.

Challenging geology, complicated chemistry, and geographically disparate assets were just some of the challenges because they required a chemical, corrosion, and production management solution to control the operational control of chemical sampling and usage.

Through effective management and information control of multiple third-party vendors, the organization could centralize all relevant wells, chemicals, corrosion, scheduling, and operational data so it could be

used, analyzed, and reported on, instead of just being stored. It led to significant savings, faster implementation regarding scalability, and reduced time for consolidating KPI reports.



## Top Energy Company Roles Out ALIM to Support Safe and Reliable Operations

A major energy company has created a Central Information Store (CIS) to manage and maintain information needed for operations, including all documents, tags, associated metadata and 3D model visualization at a new facility.

It required a solution that enables seamless migration of all this information from the project CIS, which is supporting the capital project process, to the operations CIS in an efficient way to support safe and reliable operations. This would ensure the continuity to maintain the integrity of operational information with safety first and foremost a priority.

Anne-Marie Walters, the process industry marketing director at Bentley, said, "The project stands out for its degree of complexity, scope, and

innovation in replacing handover with seamless migration of asset lifecycle information - from the design phase through construction and into operations."



## Large Gas Company Saved Millions by Increasing Reliability by 9 Percent

A major gas company undertook an advanced reliability and integrity program to ensure the availability of their product to satisfy their customer base. The idea was to automate the complete reliability and integrity framework to minimize human intervention in calculation, data collection, and analysis, as well as to manage all elements of the framework through a single integrated platform.

The project focuses on many different reliability centered areas, from equipment criticality analysis, reliability centered maintenance, and risk-based inspections, to bad actor analysis and a predictive maintenance database.

Since application, the model has significantly increased reliability performance by 9 percent, which translates to significant savings. This calculation is based on failure reduction against "mean time to repair"

and "cost of lost production opportunity" for a single station. It has a huge impact to the revenues and profits of the organization.





## Drive Your Digitalization Strategy Further with Bentley

AssetWise solutions for the oil and gas industry are only one component that Bentley software provides to help reduce risk, lower costs, improve safety, and increase performance. Bentley addresses the entire asset lifecycle, spanning design, construction, and operations for projects of any size and complexity, onshore and offshore, upstream, midstream, and downstream. It enables greater visibility and insight into design and project execution and increased management and performance of operating assets in the field or processing plant.

Central to this practice is the principle strategy of going digital. Going digital allows organizations to advance infrastructure delivery and asset performance faster and more smoothly by assessing their current business practices and the use of digital components, workflows, and context. One of the most beneficial components is leveraging the digital engineering models created within project delivery as the “digital DNA” for infrastructure asset performance during operations and maintenance. Owners and operators can share “integrated project delivery” benefits on any project—including digital workflows and increased visibility—through a connected data environment.

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