

WHITE PAPER

Embracing digital twin technology for engineering assets

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Executive summary:

With all the talk of digital transformation and digital twin technology, it can be easy to assume that industrial organizations are fully versed in both the benefits and the steps needed to successfully implement a sustainable solution.

Yet, an AVEVA survey found that 85% of industrial businesses plan to increase their digital investment.¹ More than 850 industrial digitalization experts across industries, such as manufacturing, large-scale agribusiness, food and beverage, infrastructure, energy, power and chemical processing are about to embrace digital transformation. In doing so, industrial leaders intend to use a combination of AI, industrial software, and human insight to deliver unprecedented performance.

Trusted engineering data is at the core of every successful digital twin. Engineering data provides the structure from which the twin can be created and allows 3D visualization. In this white paper, you will learn the benefits of digital twins for industrial teams and how digital transformation will help your industry adapt to global changes.

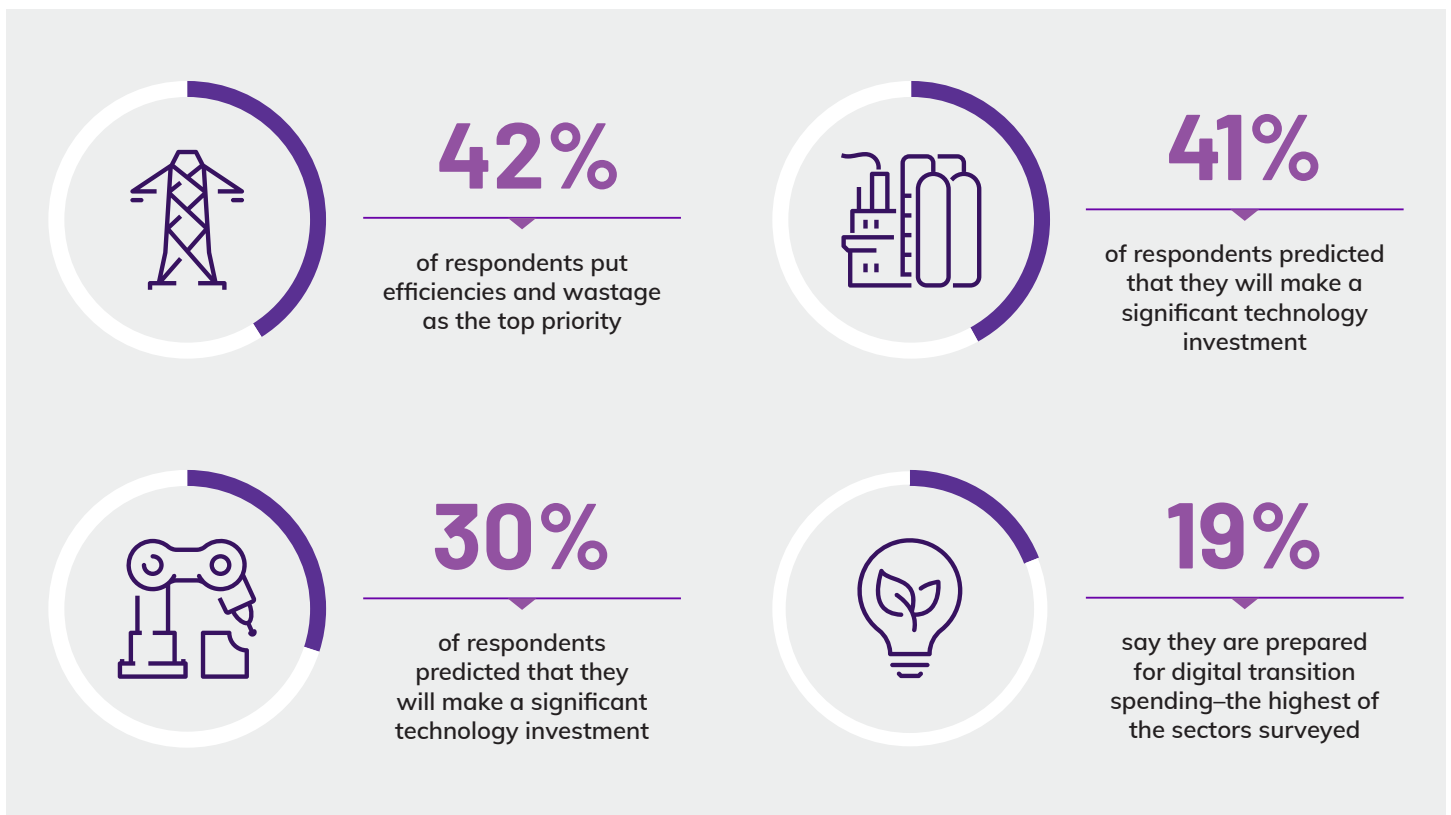
Complex challenges in a changing market

Industrial organizations require a new way of operating if they are to address the multiple challenges affecting global markets head on. Geopolitical volatility, Environmental, Social, and Governance (ESG) commitments and disrupted supply chains heighten the pressure for engineers to quickly adapt. Having instant access to a single hub of trusted data enables the right people to make the right decisions when they need to.

The increased focus on net-zero goals is one of the most significant changes to industry in recent years. Sustainable investment funds surpassed one trillion dollars for the first time in 2020, with some \$130 Bn also flooding into the COP26 Glasgow Financial Alliance for Net Zero earlier this year.

Total investments across energy sectors are projected to grow by more than 4% per year and to be increasingly focused on fossil fuel alternatives and decarbonization technologies. While returns remain uncertain, annual investment in energy supply and production is expected to double by 2035 to reach between \$1.5 to \$1.6 trillion – with almost all growth expected to come from decarbonization technologies and power.³

Digitalization technologies are both helping engineering teams to identify ways of reducing carbon emissions and providing the insights they need to identify sustainable solutions that also deliver business benefits.



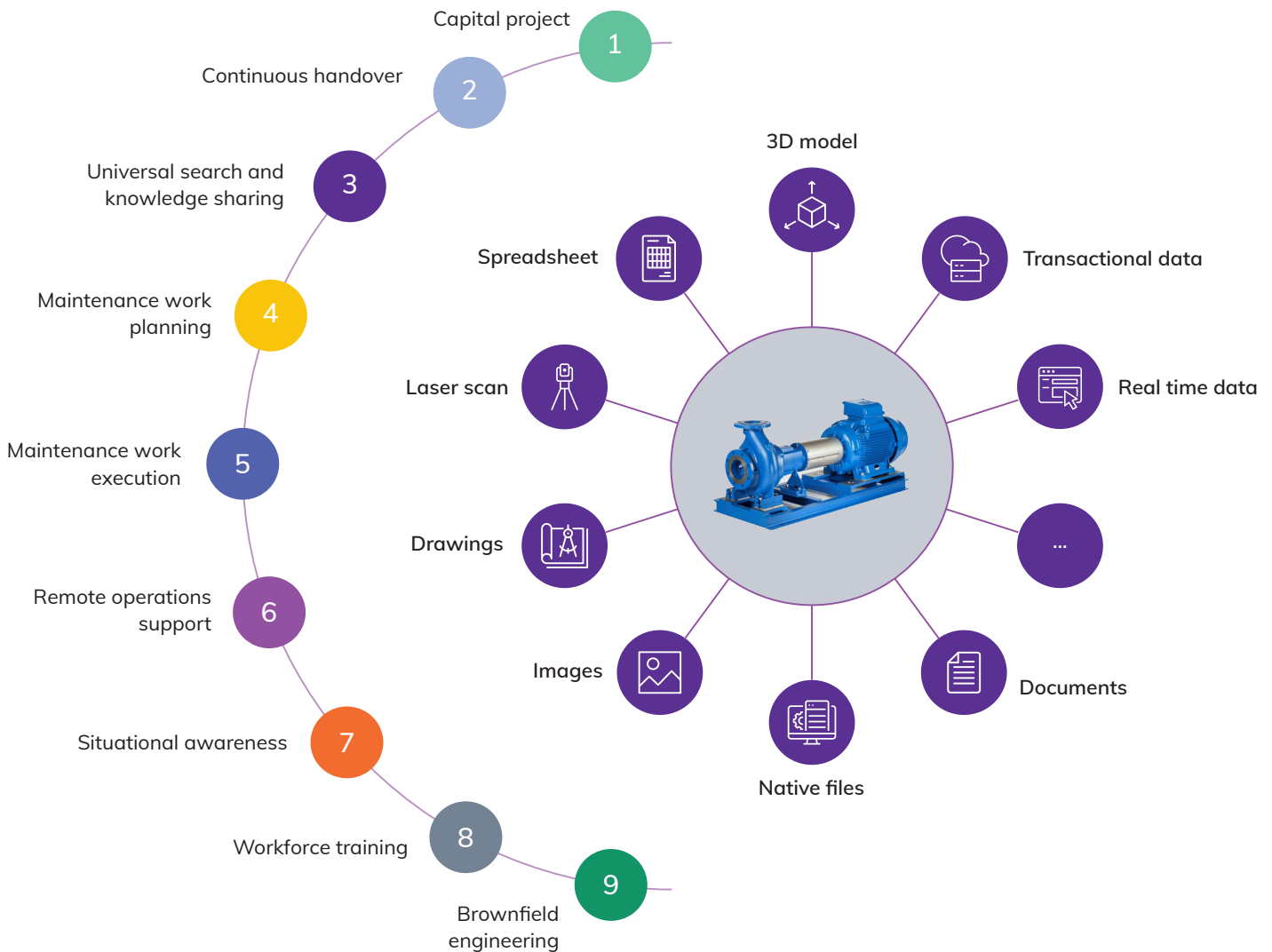
How digital twin solutions provide certainty in an uncertain world

Digital Twin technology is providing engineering, maintenance, and operations teams with stability and predictability during uncertain times. By aligning multiple engineering disciplines around a single source of verified data, risks are minimized and identified early, time wasted sourcing and checking data is eliminated, and a culture of collaboration between teams and wide stakeholders is fostered through greater transparency and bi-directional data flows.

For engineering teams, having end-to-end oversight of engineering data is the key to achieving asset excellence, driving down emissions, and optimizing output.

A single hub of real-time trusted asset information that connects disparate data feeds is at the heart of delivering transformational performance improvement. Connecting this to additional digital twin solutions is giving engineers the control and actionable insights they need to transform performance.

While every industry has differing requirements, there are broad benefits of digital twin solutions that apply at each stage of the project lifecycle from optimizing performance to increasing asset sale value and supporting decommissioning activity.



Various assets in different project stages

1. Driving asset excellence: While most industries have taken steps to digitalize, many of the platforms remain siloed and fail to address some of the greatest barriers to improving performance. A unified approach to engineering information management connects people, processes, and performance.

Practical digital twin solutions connect all engineering data, enabling engineering teams to access all relevant asset data in the context and format that best allows them to do their job – from searching for a document or schematic or a 3D laser scan and comparing them against a laser-scanned asset model. Ensuring engineers can quickly go from a high-level overview of an asset down to granular detail.

- **Minimizing risks:** Unplanned maintenance downtime is one of the biggest project risks. Access to real-time data from across activities combined with a unified asset integrity management system minimizes those risks, enhances planning activity, and reduces both wasted maintenance time and materials.
- **Manage engineering information:** Traditionally, engineers could spend up to 50% of their working time sourcing and verifying data. Digital twin solutions enable them to easily access the information they need and have confidence that it is accurate, up-to-date, and complete. With time freed from checking the information, engineers can focus on strategic, value-adding activities.
- **Drive work efficiency:** Successful digital twin projects require an evolution of project processes – trying to fit old ways of working to new uses of technology will fail to deliver full transformative potential. With the right approach and organizational mindset, a digital twin program will improve internal processes and promote collaboration across engineering teams, fostering data-driven decision making, standardization, and transparency across the organization and fleet.
- **Fast response to change:** Managing change and having the agility to respond to market dynamics become frictionless with real-time access to complete plant engineering data. While optimizing asset excellence is an immediate benefit of digital twin technology, there are longer-term gains for implementing solutions to brownfield assets. Most significantly, a digital twin can help increase the potential sale value and comply with decommissioning requirements.

2. Increasing sale value: As owner-operators seek to maximize returns from their portfolio of assets, selling plants may be an option, particularly in these uncertain times. Supplying potential buyers with a 3D laser scan of the asset linked to complete engineering data, especially full maintenance information, provides critical reassurance and can increase the value. Likewise, where engineering and asset information is incomplete or uncertain the sale value can be negatively impacted.

Providing complete data at the point of sale is as equally important as it was when the plant was first completed and handed over to the original engineer. The ability to seamlessly transfer engineering data to the new owner increases the asset's attractiveness.

3. Supporting decommission: Decommission cost accounts for 3 to 4% of the total due to unforeseen issues with either the asset or the well. Digital twin technology reduces the unknown by ensuring engineering teams have a complete picture of the asset – from the flowlines to downhole tools, and a model of the existing facility. Armed with this information, engineers, their in-house decommissioning teams and external consultants can better plan and budget the decommissioning program. What's more, they are better positioned to improve communication with regulators and engineers smoothing the process.

Digital twin solutions are transforming engineering projects:

- **3 minutes** or less to find actionable asset information
- **2 months** to deploy across the full business unit with a cloud solution
- **10%** increased staff productivity
- **30%** or more reduction in unplanned downtime

Key components of a digital twin for engineering assets

The key differentiator among the various approaches is how easily the different technology components can be unified to synchronize as-is 1D, 2D, and 3D data into a single, secure hub.


Proactive data management in the cloud: Align all teams around a robust, user-friendly Asset Information Management (AIM) system. Affordable cloud-enabled solutions are enabling engineering teams to proactively manage their data to deliver complete project on time and on budget.

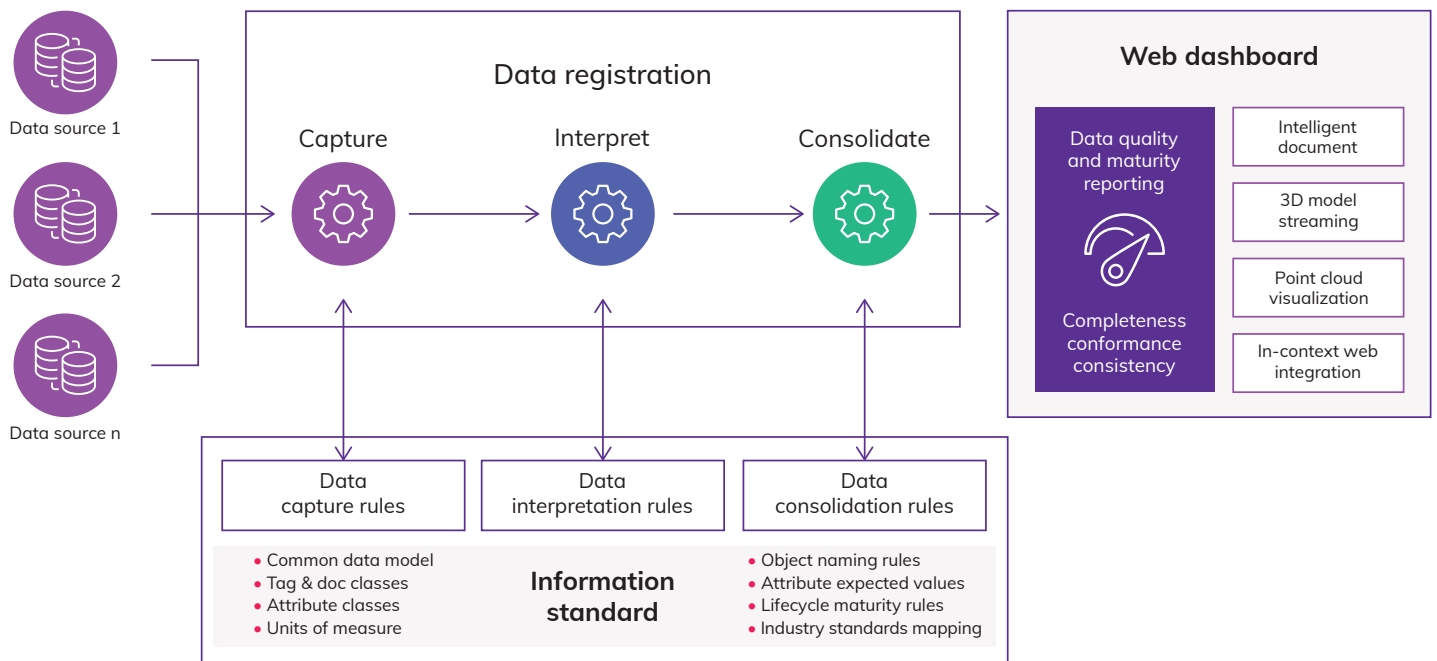
Effective AIM systems turn data from multiple information sources and systems into trusted actionable insights, identifying and cross-referencing all the relationships between equipment, documents, drawings, and various data formats. It accelerates information discovery and links distributed teams to a common data asset.

Connecting people, processes, and data ensures effective maintenance scheduling, eliminates redundant work and confusion over version compliance, and streamlines approval status and task assignment.

With a cloud-hosted tool, engineers can collect, store, and access engineering data from remote assets in harsh environments. Or from legacy assets with limited diagnostic capabilities. Out-of-the-box connectivity provides engineers and managers with end-to-end engineering visibility.

Discover how AVEVA worked with one of its largest energy clients to create an Engineering Data Warehouse (EDW) to hold the Master Asset Register for its sites around the world.

 [Click here to read the blog](#)



Laser scanning assets: Connecting 1D and 2D data to an as-is 3D model of an asset is a critical component of a successful digital twin. No longer requiring complex and expensive modeling, a laser scan connect to the point cloud provides high-quality asset visualization with links to relevant engineering data to enable teams to make the right decisions, fast.

By connecting laser scanned data to the point cloud, an unlimited number of users can access the photorealistic environment which provides invaluable context to the information and intelligence needed for modification projects and day-to-day maintenance and operations. They can also use 3D mark-up functionality to add and share information across multiple teams.

When teams are aligned around one trusted source of secure data, the risk of working from outdated visualizations or multiple versions existing is eliminated. Now, 3D point cloud data is delivered exactly where it should be, instantly. Global teams have an easy and simple way to create, share, and maintain the trusted data they need to optimize brownfield capital and maintenance projects effectively. Learn more about laser scanning and the point cloud [here](#).

Analyze real-time and historical data: Systems enable users to extract critical insights about asset health by connecting disparate data sources. The solution seamlessly manages the data collection process, enabling engineers to spend their time analyzing collected data and making recommendations. Unlike calendar-based inspections and periodic assessments, it detects small but critical equipment changes so teams can quickly act.

It's time to take the first steps toward your digital twin

There can be a vast difference between understanding how digital twin technology can benefit industrial organizations and knowing the steps to take to begin reaping those benefits. The whole process can seem overwhelming and unachievable.

There are some simple steps that heads of engineering can take to plot their route to implementing a successful digital twin. These include:

- Understand what you need to achieve to improve engineering performance both short-term aims and long-term goals. Define how digital twin solutions will add value to your business.
- Audit the solutions that you currently have and identify areas that you need to improve. This could be connecting siloed data feeds across the plant into a single platform, for example, or undertaking a laser scan of the asset to improve maintenance planning.
- Find a partner who can help demonstrate how a cost-effective approach can deliver short-term return on investment.
- Get started. There is no ideal moment to start. One of the benefits of today's solutions is that there is no "one and done" approach. Choose technology that scales easily enabling you to add additional tools as required and scale to more users and assets if needed. Taking the first steps enables you to build confidence and prove its value before building and evolving further.
- Find a trusted partner to help deliver a sustainable improvement program. A partner who knows your industry will be best placed to guide you through the choice of solutions to build a digital twin that aligns with your organizational needs.

Transforming engineering performance with Asset Information Management

Digital twin technology is connecting asset information to give engineers a level of end-to-end overview and control that they have never had before. With real-time access to all 1D, 2D and 3D data in the cloud, multiple teams can simultaneously collaborate to minimize risks, and respond to opportunities, ultimately transforming asset performance.

Where once digital twin solutions were seen as expensive and complex – offering little returns for existing and aging assets – today's tools provide an affordable, out-of-the-box answer to the myriad of challenges facing current industrial project challenges. Fast to implement, requiring minimal set-up and ongoing maintenance, a unified approach to Asset Information Management in the cloud combines proactive document management with real-time analysis and 3D modeling to provide engineering teams with granular level insights.

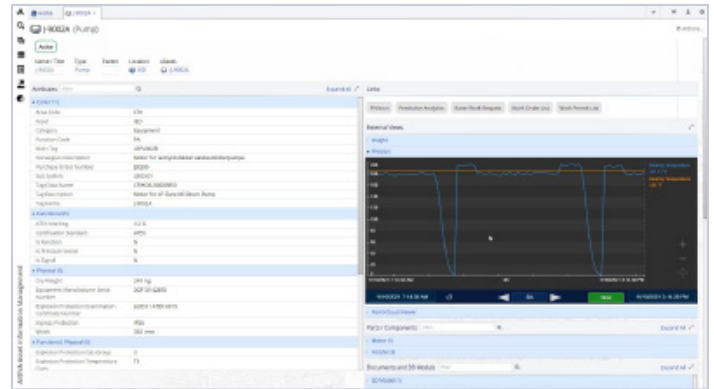
Engineer a trusted digital twin with AVEVA solutions

AVEVA's engineering information solutions are helping industries to implement their digital transformation through a trusted digital twin. The largest energy, chemicals, and power companies already trust AVEVA to help them build their digital twins and adapt to the global market changes.

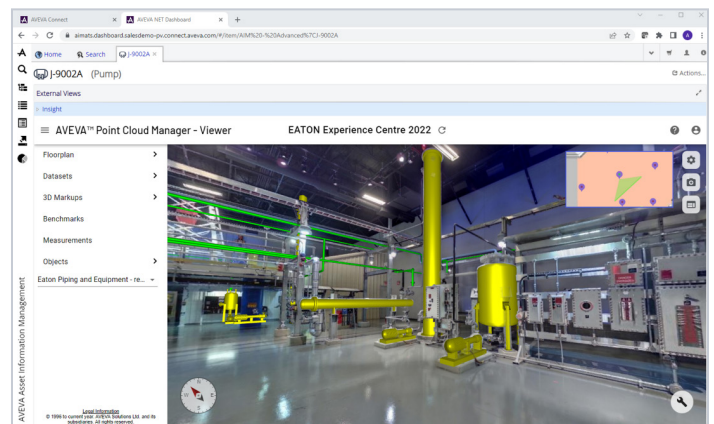
AVEVA™ Asset Information Management with the help of **AVEVA™ Information Standards Manager** integrated in a 3D visualization tool (**AVEVA 3D Asset Visualization**), collects data (historical and real data from **AVEVA™ PI system™**) from multiple information sources and turns it into actionable insights. This setup can automatically detect and cross-reference all the relationships between equipment, documents, drawings, and various data formats.

AVEVA™ Point Cloud Manager is a cloud-enabled 3D data capture solution for registering, processing, and visualizing point cloud and 3D model data on brownfield, greenfield, and maintenance projects. The solution helps engineers ensure that the digital twin and its real-world counterpart are accurately aligned, which improves decision-making and safety and reduces rework on their most critical assets.

These solutions integrate seamlessly in the cloud to connect point-cloud and 3D design model data with all other asset information, creating deeper contextualization and better visualization of the digital twin. Both solutions are available on **AVEVA™ Connect**, our industrial cloud platform, as software as a service (SaaS) offerings. With AVEVA's support and the support of our partners, it is easier than ever to create real-time digital twin, keep it updated, and start gaining more valuable insights.



AVEVA Asset Information Management dashboard



AVEVA Point Cloud Manager dashboard



AVEVA 3D Asset Visualization dashboard

References

1. AVEVA Report: Approaching the Age of Performance: Insights from industries in evolution.
2. McKinsey & Company: Global Energy Perspective 2022
3. McKinsey & Company: Global Energy Perspective 2022
4. The International Journal of Life Cycle Assessment: [An economic assessment framework for decommissioning of offshore wind farms using a cost breakdown structure, 2021.](#)

About the author

Steve Parvin, VP Engineering Information Management, Portfolio Strategy. Steve is a qualified Chemical Engineer, who gained his first experience working with engineering data as a plant support engineer on a chemical plant, which was built in 1940s. He has more than 20 years of experience in engineering information management, working as an IM consultant alongside large owner operators and EPCs on MCPs around the world (Australia, Kazakhstan, Middle-East, UK, US). Steve represents AVEVA at the IOGP, CFIHOS (JIP36) meetings and leads the Software Vendor Team, which comprises many industrial software vendors.



Learn how AVEVA Asset Management Information can improve engineering efficiency, collaboration, and project outcomes

Discover how you can accelerate transformational outcomes with a hybrid cloud approach

[Click here to speak to one of our digital twin experts](#)



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