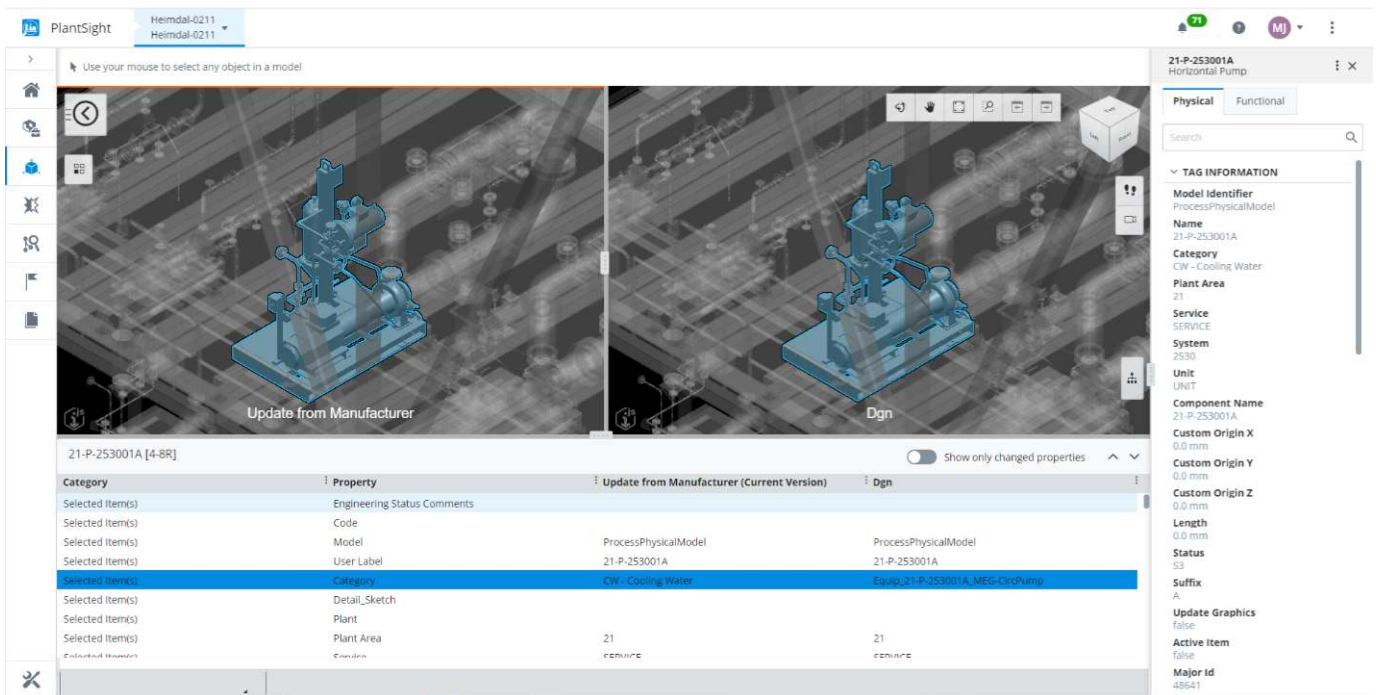


From Strategy to Reality: A Working Digital Twin

How long are you willing to wait for information? For information in which you have confidence because it is accurate and up to date? Minutes? Hours? Fast access to correct information can mean the difference between a safe and an unsafe working environment or between an asset that can keep operating and one that must be shut down. Being sure that the information in front of you is the latest and is complete means you can make decisions quickly, without hunting for more data. Creating such a digital solution has been an ambition for years, and digital twin technology is finally rising to meet the challenge. We spoke with several implementers to learn the latest.

What is a digital twin? Simply put, it's a virtual representation of an asset, system, or process. A twin may be static if it doesn't incorporate a continuous stream of updates in the representation—valuable, say, for periodic design reviews—or it may be live, with sensor data reporting on the asset's condition in use. Bentley Systems' PlantSight enables plant operators to build and use near-live digital twins in an intuitive, immersive, and role-based user interface.



PlantSight surfaces current engineering, operational, and maintenance information in a form that's easily understood.

Plant staff already collect, store, and analyze plant data to improve operations. PlantSight federates this data, giving operators visibility into how an asset is performing today and showing them what could negatively affect production, the environment, or staff, or impact budget, profitability, or regulatory compliance. PlantSight is a single entry point for many types of data, combined and organized to meet specific user needs.

PlantSight in Brief

Siemens and Bentley created the PlantSight application to be open, configurable, and cloud-native to offer situational intelligence about an asset, whether that's a single object, a system, or a complete plant. PlantSight is hosted on Microsoft Azure, using the latest communications and security protocols to ensure safe access from anywhere.

Powered by the Bentley iTwin platform, PlantSight combines data from many sources and makes it accessible from a single portal interface. System administrators combine source materials to create a comprehensive view of the asset. Inputs could include drawings, process flow diagrams, CAD and reality models, data from asset management systems like Bentley AssetWise, sensor data—anything that an operator might need to understand and operate the plant. PlantSight is synchronized to these data sources to reflect the asset's status in near real-time, so users can visualize the asset, check status, perform analysis and generate insights to optimize performance. PlantSight also tracks how the asset changes over time, enabling operators to anticipate problems. A PlantSight digital twin eliminates data silos by integrating data from many sources and making this visible to authorized users; this enables tighter collaboration across disciplines to predict and resolve problems.



PlantSight allows engineers and operators to view assets simultaneously in reality models and P&IDs.

In many ways, gathering the data for PlantSight is the most challenging part of creating the digital twin. After all, for the digital twin to be trusted, it must include only validated, current, and complete data sets. Once that baseline is set, the data must be updated as the asset changes through maintenance and other activities. PlantSight incorporates services that streamline this process, retaining the value of the digital twin.

Once that PlantSight digital twin exists, it gives plant operators easy and consistent access to information. Users can configure their screens to quickly gain access to the information they need in a context that's familiar to them. And each operator sees what they need, drawn from a consistent whole — no matter the trade or area of expertise. It's all connected.

But PlantSight is more than access to data. PlantSight also enables operators to surface that data, apply asset performance analytics, and then share those results with others to optimize plant operations. And, because changes are tracked and data provenance is available, users can trust the data.

This combination of up-to-date plant data, access to analytical tools and results, and visible change management means that you can operate your digital twin alongside the physical plant.

The Current State of Play

Many plant operators (and their EPC contractors) want to build digital twins to work alongside the physical assets. Most of these projects are still in implementation mode, as gathering and validating baseline information for older assets can be challenging. We are starting to see some best practices emerge as operators design their digital twins:

1. Digital twins can and probably should come in many flavors and levels of detail. Each phase of a plant's life creates and relies on new, significant information, but not all data needs to be promoted from one stage to the next. As you develop your twin, consider the stage of the project, what matters most, and target the twin to only that information.
2. If you use PlantSight, you're gaining all of the advantages of a modern, standards-based, cloud-native platform. If not, you'll need to ensure that your users have a single point of data access to both draw *from* and feed *into* discipline-specific systems (asset maintenance, asset performance, enterprise resource planning, etc.). Easy access to consistent information means your operators will use a digital twin instead of going around it to their more traditional (but less reliable) sources of information.
3. Cloud-based systems like PlantSight support connect-from-anywhere work, linking personnel wherever they are into the digital environment. The team can access work instructions and remote help as they need to and then feed data from operator rounds back into a digital twin to add as-operated intelligence. Consider how often the PlantSight digital twin needs to be updated to reflect these changes — too often is confusing for operators, but not often enough can lead to outdated information being used in decision-making.

Who is Building Digital Twins Today?

As we said above, it's early days — but both operators and their EPC contractors are looking at PlantSight to help with profitable, safer operations. We're seeing implementations across industries and geographies as operators seek to improve efficiency and meet their environment, social, and governance (ESG) goals.

Asset owners and operators are looking at digital twins to help improve plant performance and define predictive/preventative strategies. They need to optimize shutdowns and turnarounds by trying out options digitally before anything happens in the physical plant.

Operators with more modern plants that they want to optimize for energy usage, carbon emissions, or another purpose begin their PlantSight journey by building an as-is asset model, then connect that to sensors and reliability systems. The goal is to understand the asset's condition and performance today, build confidence in the twin, tweak operating processes, and ultimately prepare for a refurbishment project.

Older assets, which may have little or no up-to-date digital info, may be more challenging. Asset owner/operators consider what the operations staff needs and then work backward to find or generate that data. They may create a 3D model, perhaps via laser scan or image capture, to make it easier for stakeholders to visualize the asset. Then they add intelligence such as tags, flow diagrams, operator manuals — all can be managed and accessed via PlantSight.

The creators of a digital twin need to decide how much data is enough. Who will use the digital twin in their day-to-day activities, and what do they need? Find that data, validate it and start using the digital twin. It is always better to start small, build success and prove that this digital twin concept works in your context — but with an overarching vision of what you want to achieve.



Bentley's Context Capture software creates a reality model, a quick way to start building a 3D digital twin.


What Have We Learned So Far?

Many people make creating a digital twin both too complex ("we need ALL the data") and too simple ("just throw it all into PlantSight and figure it out later"). Gathering all possible data, validating it, and managing it is too challenging — and is probably unnecessary since some of it might never be used. And embarking on this type of project without an endgame in mind will make it hard to measure its success. Follow these lessons learned by early implementers:

- a. Start modestly but with the big picture in mind. Identify a clear business goal or objective and then gather data for/about a critical asset/system rather than the whole plant/project. PlantSight's pricing allows you to start small and scale fast, adding assets and users as you need to and as you see the benefits of PlantSight.
- b. Remember that not all plant data is in 3D models. You can start populating a digital twin with 2D P&IDs, PFDs, drawings, and documents and supplement this with reality models if your users prefer to work in a three-dimensional context. Some trades more naturally gravitate to 2D representations or lists, while others need 3D. For the latter, you could start with a reality model if CAD models don't exist — or if you decide it will take too much time and effort to clean up old, messy 3D models.
- c. But you *do* need structure in the data model for your twin to organize what you have and point out what you still need. This will save time in the long run and help get you to a complete digital twin. A CAD model or a sound tag management system (such as the Asset Register within Bentley's AssetWise ALIM) could create this structure.
- d. Depending on your business case and the plant's specifics, your digital twin may be a process simulation or process flow simulation and not rely on CAD at all. What are you trying to achieve? Create a digital twin that is sufficient for your needs and not unnecessarily complex. But be ready to expand if PlantSight adoption spreads to other operations within your plant.
- e. Map out current work processes to ensure you gather all of the data your operators need and to show affected employees that this is to their benefit. The workflow in PlantSight should match the traditional work process as much as is reasonable. This will simplify training, and operators will more readily adopt this new way of accessing information.
- f. Getting users to trust the digital twin is extremely important. Starting with poor quality models or out-of-date laser scans will erode confidence. But if it starts with reliable data, is easy to use, and becomes a trusted source, staff will embrace the digital twin and work to keep it current.

Even if you follow these best practices, be prepared: It will be challenging to calculate a return on investment for your digital twin. The costs will be easier to measure since you'll be paying for software and its infrastructure — known costs — but you will probably spend more on finding and validating existing plant data.

Eventually, you'll be able to measure faster access to information (such as saving 1 hour/day per operator)— but that is the least of the potential benefits of a digital twin.



The real benefits of a digital twin are shutdowns averted, safety incidents avoided, production increased. At a potential cost of \$200,000/hour of downtime, a digital twin quickly becomes a must-have with a potentially powerful return on investment.

The Bottom Line

Plant operations across industries recognize the need for solutions that better connect assets, people, and information. A PlantSight digital twin is the front end to data from disparate plant systems, enabling users to access critical information quickly and in context.

There are many digital twin tools on the market. On its own, Bentley's PlantSight can take data from any system and combine it to create a living, breathing digital twin. Combining PlantSight with Bentley's design tools or AssetWise makes building and maintaining the digital twin simpler because many connections are already built.

Think of PlantSight as a pane of glass that enables you to see all of the data used to build your asset, including all of the iterations and decisions to get to today's plant, overlaid with operating info, to help make better-informed decisions about maintenance and operations.

PlantSight is a system of systems that enables you to put all of this data together, regardless of source, to gain more value from the capital you've already invested in your plant.