Industrial manufacturing industry leverages reality modeling for design, construction, and operational challenges

Manufacturing companies are always looking to extend, expand, or revamp their production facilities, whether it’s to make a new product to remain competitive or to meet changing environmental regulations. Quickly ascertaining the options for making such changes can be costly and time consuming. As a solution, reality modeling provides the digital, real-world context of existing production facilities and equipment and provides a faster way to capture as-is conditions to support engineering, inspections, maintenance, and operations.

Reality modeling is the process of capturing existing site conditions using photographs and, when additional accuracy is needed, point clouds to create high-fidelity, georeferenced 3D models. 3D reality models generated by ContextCapture, Bentley’s reality modeling software, offer a complete, up-to-date representation of the asset as a single, digital source. It can be easily shared and streamed in other software applications for better asset management. All stakeholders can be connected, accelerating the decision-making process during the workflows of an asset’s design, construction, operation, and inspection.

3D Models Provide Digital Context for Engineering Design Workflows
Reality modeling accelerates the decision-making process with advanced knowledge and insight into existing site conditions.
- Carry out installation, operations, and maintenance simulations to evaluate potential impacts
- Understand financial implications early
- Streamline decision making
- Improve information sharing and collaboration

3D Models Accelerate Project Delivery during Construction Workflows
Reality modeling gives an accurate perspective of the job site, allows the monitoring and evaluating of progress, and enables the verification of a job performance with the design.
- Ease collaboration among stakeholders
- Provide up-to-date construction documentation
- Improve safety
- Lower costs of as-built survey

3D Models Improve the Operations and Maintenance of Assets
Reality modeling supports asset management by providing an in-context, visual view of equipment linked to operations and engineering data linking 3D-registered equipment to operations and engineering data.
- Optimize maintenance and service activities
- Lower cost of asset inspection
- Improve safety
- Develop more repeatable inspection processes
- Provide easier access of hard-to-inspect locations
- Safeguard against asset downtime
UCB SA is a global biopharmaceutical company with a research and production facility located in Braine-l’Alleud, Walloon Brabant, Belgium. The company initiated an environmental project to progressively reduce carbon dioxide emissions over 13 years to reach neutrality by 2030 using solar panels on-site as a viable solution to help reach its target. To perform the necessary analyses required for integrating solar panels and determining optimal locations for the panels, UCB decided to create a 3D model of the 50-hectare site.

The project team used ContextCapture to generate an accurate 3D reality model from aerial and ground photography and integrated scanner point clouds using Descartes to improve depictions during final modeling. The accurate 3D model enabled rapid, accurate analysis and optioneering, and allowed UCB to calculate actual and planned quantities, as well as obtain precise measurements for construction companies and internal management for installing the solar panels.

Project Playbook: AECOsim Building Designer, ContextCapture, Descartes, MicroStation

3D modeling of our site using ContextCapture provides georeferencing and allocates geographical coordinates to our elements. Using this modeling, and based on orthophoto drawings, we integrate our official data on land registries, waterways, and buildings. With the contributions from OpenPlant Modeler and OpenPlant Isometrics, our facilities are drawn with 3D with precision and automatic detection of clashes between pipes, structures, and equipment.

— Joseph Ciarmoli, Head of CAE Engineering, UCB
The interoperability of Bentley products has made it possible to optimize and significantly reduce the survey and reality modeling time. It also allows us to create a BIM model that can easily be used by all stakeholders to significantly improve the efficiency of their integrated design and allow implementation of the first revamping phase to be reached just three months after delivery of the BIM model.

– Marco Barberini, Engineer, BM Engineering S.r.l.

The steel mills in Udine, Italy require expansion and modernization to minimize environmental impact of the production fumes extraction system. The modernization of the site required a comprehensive survey of approximately 43 hectares, including structures, systems, piping inside the plant, and difficult-to-access external areas.

The project team used various survey methods to capture the complex infrastructure, processed the data into point clouds within Pointools, and generated a 3D reality mesh using ContextCapture, linking the information in MicroStation and AECosim Building Designer for rapid generation of the BIM objects. Using ContextCapture to reconstruct the roofs of the industrial buildings from the photo survey eliminated the need for dangerous on-site surveys and associated temporary provisions, saving at least EUR 70,000. The interoperability and automated capabilities of Bentley technology reduced post-processing times allowing the final deliverable to be completed within 45 days of the surveys.

Project Playbook: AECosim Building Designer, ContextCapture, MicroStation, Pointools

BM Engineering S.r.l
Buttrio, Udine, Italy
Revamping ABS Steelworks
To demonstrate to the local municipality that expanding an operating industrial ethanol production plant in Liberal, Kansas would not negatively impact neighboring properties, Flightline Geographics was retained to provide site survey and reality modeling services for a drainage study. Flightline had to complete its deliverables within a short timeline and on a tight budget. Using small unmanned aerial vehicles (sUAV), the team surveyed the 200-acre site and delivered a 3D reality mesh to illustrate that existing containment and drainage systems were adequate to handle the expanded plant capacity.

ContextCapture processed over 1,000 images captured in one hour into a 3D reality mesh in two days. The engineers used the reality mesh to quickly calculate results for the drainage and construction study, and the plant received its permit within one week. Using ContextCapture enabled Flightline to process the large dataset three times faster than traditional methods and to complete the project ahead of time and under budget.

**Project Playbook:** ContextCapture

"Reality modeling using Bentley’s ContextCapture enabled Flightline Geographics to process a large amount of data into information for the client in near real time. The project was completed ahead of time and under budget, allowing the company to acquire its expansion permit and move on with production of renewable energy."

— Devon Humphrey, CEO, Flightline Geographics
With a goal of implementing a maintenance management system for Samsung Electronics’s existing facilities in Giheung, Gyeonggi-do, South Korea, IAAN Soft used reality modeling to conduct a feasibility study to determine the status of Samsung’s underground structures. Studying the underground areas using virtual models integrated with associated geospatial data provided an innovative new solution for building an operations management system for Samsung’s current facilities.

Using ContextCapture, the team generated a 3D reality mesh of the worksite and used Descartes to refine the reality mesh. AECOsim Building Designer allowed the team to share the 3D model and add location information, including additional operational data that could be linked to the model throughout the facilities management stage. Bentley technology enabled the project team to verify the feasibility of implementing an operations management system within one week.

**Project Playbook:** AECOsim Building Designer, ContextCapture, Descartes
The Energy Factory Knappenrode in Saxony, Germany is a former industrial facility that is now a museum. Because the numerous assets are difficult and expensive to maintain in their original size and capacity, machines that are redundant or visually unappealing will be dismantled. To preserve the cultural heritage of the structure and assets, authorities mandated comprehensive documentation to be compiled prior to renovations. 3D ScanWorld worked with community agencies to perform 3D laser scanning to capture the layout of the entire factory.

The team used the dataset from the scans to create architectural drawings of floor plans and cross sections as point clouds and imported them into Pointools for visualization and integration into the digital historical building stock. Using Pointools allowed the team to remove distracting elements and focus on essential components, develop visual documentation with elaborate image retouching multiple times faster than with classic photo documentation, and navigate point clouds for review. As a result, a uniform set of architectural plans is now available for different disciplines.

**Project Playbook:** Pointools

> When working with the 3D laser scan, I often had to think about the grain of truth in Mark Twain’s words: ‘A person with a new idea is a crank until the idea succeeds’.
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> – Susanne Schiffner, CAD expert, 3D ScanWorld
About Bentley Systems
Bentley Systems is a global leader in providing engineers, architects, geospatial professionals, constructors, and owner-operators with comprehensive software solutions for advancing the design, construction, and operations of infrastructure. Bentley users leverage information mobility across disciplines and throughout the infrastructure lifecycle to deliver better-performing projects and assets. Bentley solutions encompass MicroStation applications for information modeling, ProjectWise collaboration services to deliver integrated projects, and AssetWise operations services to achieve intelligent infrastructure—complemented by comprehensive managed services offered through customized Success Plans.

For additional information, visit www.bentley.com.

About ContextCapture
ContextCapture is Bentley’s reality modeling software that can quickly produce 3D models of existing conditions for infrastructure projects of all types, derived from simple photographs and/or point cloud. Without the need for expensive or specialized equipment, ContextCapture enables users to quickly create and use these highly detailed 3D engineering-ready reality meshes to provide precise real-world context for design, construction, and operations decisions throughout the lifecycle of projects. Project teams can easily and consistently share reality modeling information, consumable and accessible, on desktop and mobile devices, in many formats, including native use within MicroStation for any engineering, operations, maintenance, or GIS workflow.

For additional information, visit www.bentley.com/ContextCapture.