Digital Twins in the Process Industries

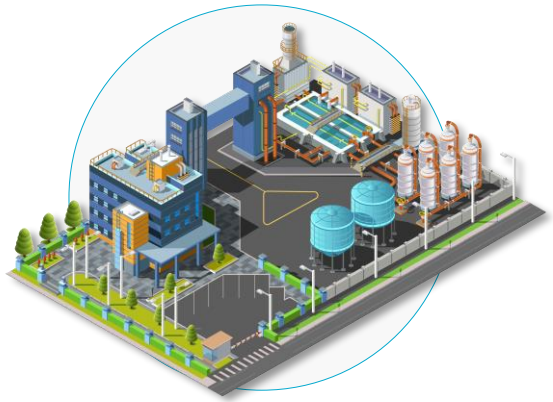
Bentley Systems
Anne-Marie Walters, Industry Marketing Director

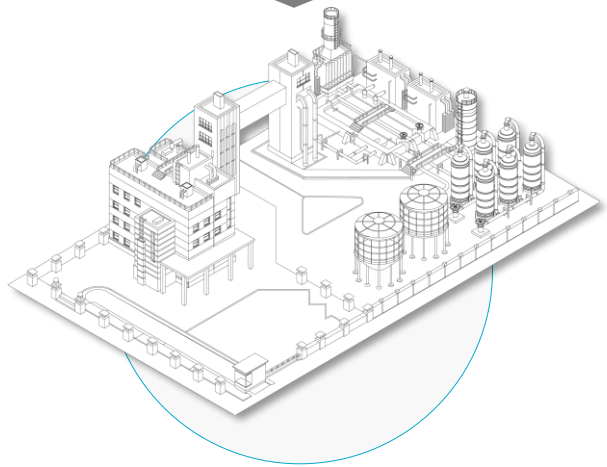
Bentley
Advancing Infrastructure

What is a Digital Twin?

A 4D digital representation of physical assets, processes, or systems.

Real-world





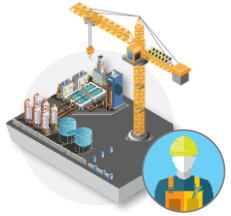
Digital twin

ET Engineering Technology	P&ID/PFD Drawings Documents Models	Analyses Geotech OEM specs	
OT Operations Technology	IoT feeds Sensors Drones	Cameras LiDAR Point clouds	
IT Information Technology	Asset tags Maintenance records	Work orders Inspection records	

3D/XR	Immersive Visualization
4D	Timeline of Change
AI/ML	Analytics Visibility

Bentley

Digital twins enable you to visualize an asset, track changes, and perform analyses to better understand and optimize asset performance throughout the entire lifecycle.

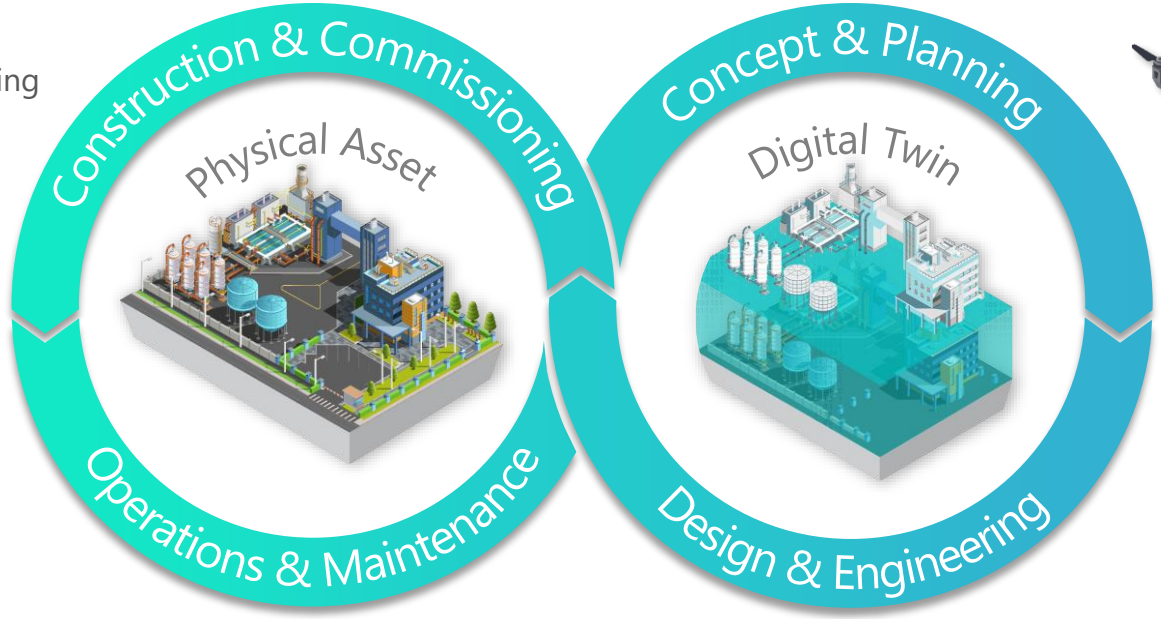


- 4D construction modeling
- Simulate logistics
- Track progress / status

- HSSE training
- Operator training

- Remote inspection
- Leak detection
- Corrosion detection

- Maintenance planning
- Shutdowns
- Verification before execution



- Site survey
- Reality capture

- Stakeholder engagement
- Planning and visualization
- Design collaboration

Bentley

Why do Process Industries Need Digital Twins
Common Challenges Facing Operators

Safety Targets

Aging Assets

Regulatory Compliance

Managing Ecosystems / Integration

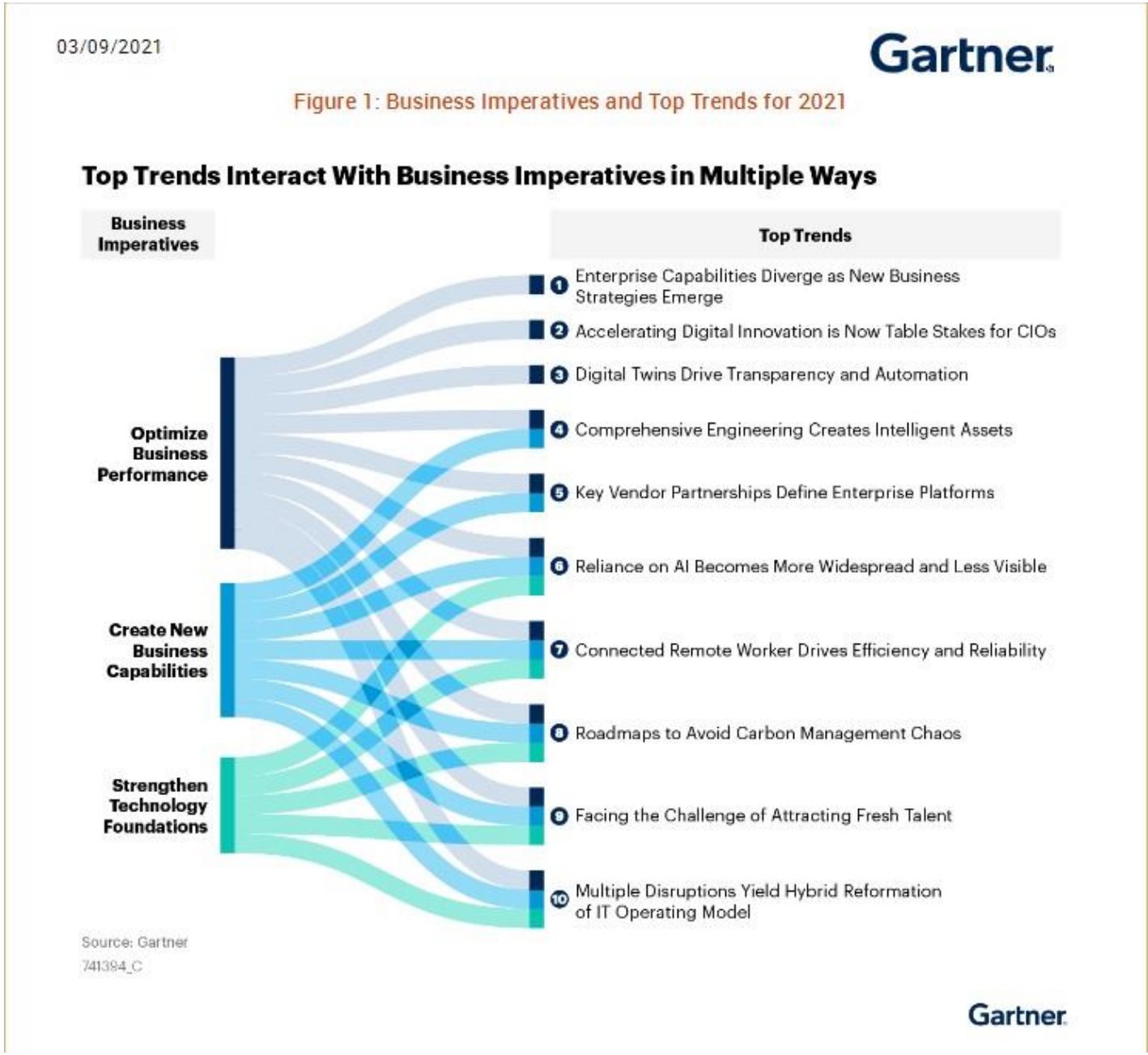
Optimizing Asset Performance

Business Changes – Net Zero Carbon

Bentley

Gartner Top 10 Trends

- Scaling across the enterprise remains a challenge.
- Oil and gas companies struggle with non-integrated data.
- Too many old systems:
  - Operating costs are high.
  - Change is slow.
- Digital twins drive transparency and automation.



Bentley

PlantSight™

SIEMENS

Bentley®

News Release

Press Contact:
Jennifer Maguire
+1 610 458 2695
jennifer.maguire@bentley.com
Follow us on Twitter:
@BentleySystems

Siemens and Bentley Systems announce *PlantSight*™ digital twin cloud services

- **Solution enables up-to-date, as-operated digital twins – synchronizing the real plant and its engineering representations – for more efficient process plant operations**

- **Integration of different kinds of data sources to create holistic digital context for aligned digital components**

The *Year in Infrastructure 2018* Conference, London, U.K. – Oct.15, 2018 – Siemens and Bentley Systems announced today the introduction of *PlantSight*, resulting from development together based on their highly complementary software portfolios. *PlantSight* is a digital solution to benefit customers through more efficient plant operations. *PlantSight* enables as-operated and up-to-date digital twins which synchronize with both physical reality and engineering data, creating a holistic digital context for consistently understood digital

PlantSight – Digital Twin for the Process Industry
For Digital Line of Sight and Operational Excellence

Process Plant challenges today

Silos of Data	Equipment and Process Failures	Volume and Complexity of Data

PlantSight
3D Asset Portal – the One-Stop Shop for the Digital Twin

CONSOLIDATE

Connected & Contextualized Data Environment

COLLABORATE

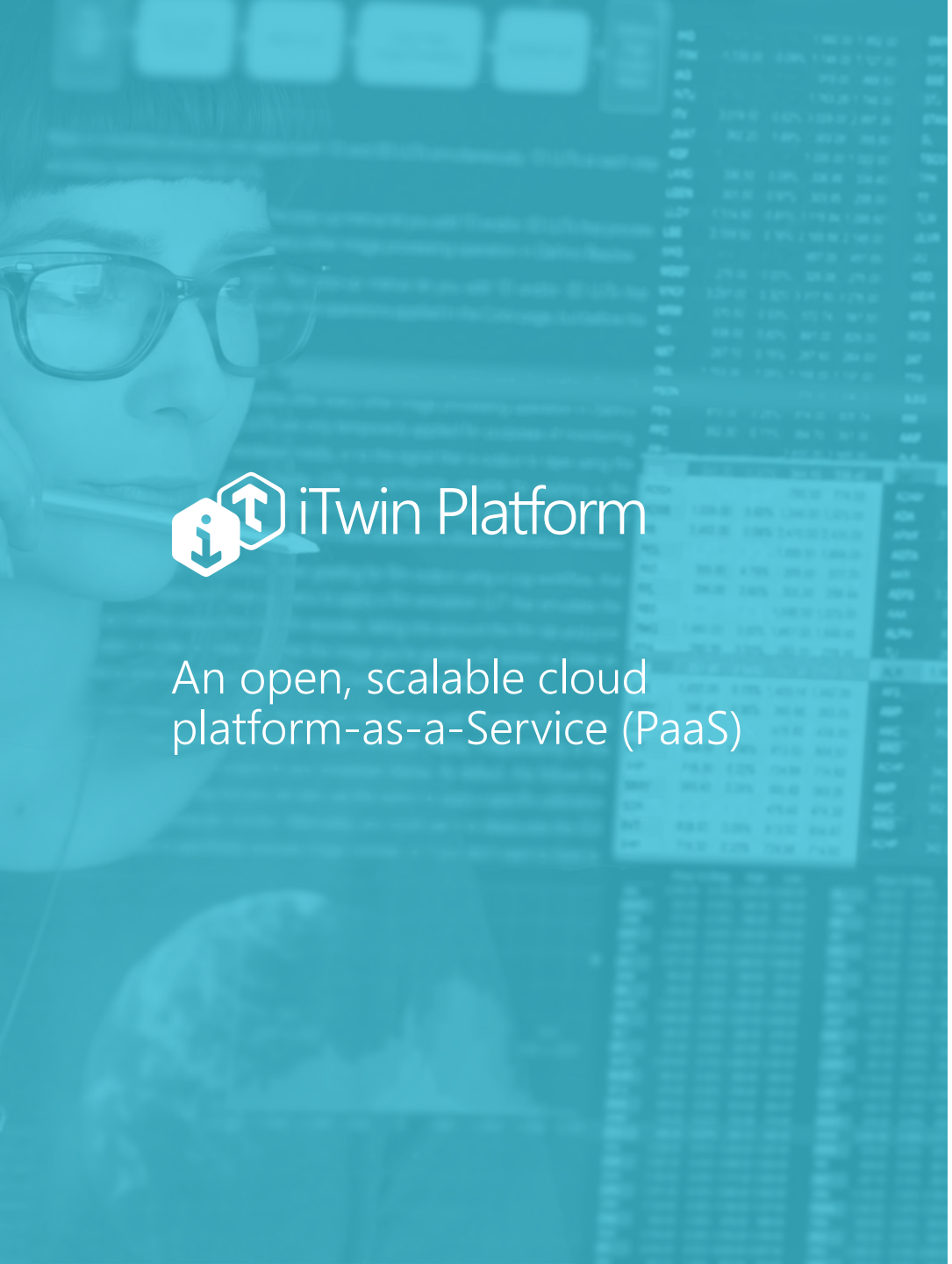
Analyze Using Risk-Based Reliability Strategies & APM

GAIN INSIGHTS

At Your Fingertips for Fast and Accurate Decisions

Increase asset availability, improve workforce efficiency & lower total cost of asset ownership

Bentley SIEMENS



iTwin Platform

An open, scalable cloud platform-as-a-Service (PaaS)

Digital Twin Platform

Our objective

- ✓ Provide *enabling* technologies for infrastructure digital twin solutions.

Our expertise

- ✓ Aggregation and alignment of CAD, BIM, and GIS data.
- ✓ Change tracking for complex engineering data.
- ✓ 3D / 4D visualization.
- ✓ Federation of disparate data (business systems, IoT, etc.).
- ✓ Reality data.

Bentley®

Building Your Digital Twin Solution

Your Digital Twin Application

YOUR APIS & SERVICES

iTwin Platform (PaaS)

Create	**SYNCHRONIZATION** (Engineering design data)	**FEDERATION** (Business systems, IoT data, maps, asset performance, etc.)	**REALITY MODELING** (Reality mesh, point clouds, etc.)	**DATA MANAGEMENT** (iModels, file sharing, change ledger)
Interact	**VISUALIZATION** (iTwin Viewer, tile streaming, game engines)	**REPORTING** (Querying, insights, report generation, PowerBI)	**AUTHORING** (iTwin Editor, extensions)	**ADMINISTRATION** (Users, permissions, context management)
Workflows	**ADVANCED WORKFLOWS** (Issues, clash detection, version comparisons)	**AR / VR** (GLTF, Azure remote rendering)	**AI / ML** (Inspection, validation, element recognition)	**EXPORT** (IFC, LandXML, etc.)
DevOps	**MANAGE KUBERNETES** (Handle loads and query traffic, provisioning)	**SLA** (High availability, patches and updates, support)	**GLOBAL DEPLOYMENT**	**STORAGE AND DATA RESIDENCY**

Built on Microsoft Azure

Bentley®

Supported Design Applications and Interchange Formats

Bentley Design Applications

- AutoPLANT Modeler
- MicroStation CONNECT Edition
- MicroStation V8*i*
- OpenBridge
- OpenBuildings Designer
- OpenPlant Modeler
- OpenPlant PID
- OpenRail Designer
- OpenRoads Designer
- OpenSite Designer

Third-party Design Applications

- 3D Studio (.3ds)
- AutoCAD
- AVEVA Diagrams
- AVEVA E3D
- AVEVA PDMS
- AVEVA PID
- Civil 3D
- Intergraph Smart 3D
- Intergraph Smart P&ID
- Revit
- Rhino (.3dm)
- SketchUp

Interchange Formats

- ACIS (.sat)
- CGM
- DXF
- FBX
- iModel
- IFC
- IGES (.igs)
- JT
- Land XML
- OBJ
- MIF / MID
- Parasolid (.x_t)
- Shape files (SHP)
- STEP (.stp)
- STL
- VUE

https://communities.bentley.com/products/digital-twin-cloud-services/itwin-services/w/imodel-bridges-wiki/47595/supported-file-formats

Bentley®

BP Oman Ensures Operational Readiness with Seamless Migration of Information Model from CapEx to OpEx

CHALLENGE

- ✓ Replacing handover with a seamless migration of asset lifecycle information – for operational readiness from the design phase through construction into operations.

SOLUTION

The creation of a "Central Information Store" powered by Bentley's digital twin applications and a connected data environment.

- ✓ Management and maintenance of engineering and asset info, including documents, tags, metadata, and 3D model visualization.
- ✓ Seamless migration of data from project to operation.

BENEFITS

- ✓ BP started production ahead of schedule and under budget.
- ✓ Information search time dropped by 30%.
- ✓ Data exchange time dropped by 70%.
- ✓ Document coordination efficiency improved by 25%.

Hatch - Sulphuric Acid Plant in the DRC

- First “paperless” project
- Cut three months off schedule
- Design capacity achieved within one week of hot-start up

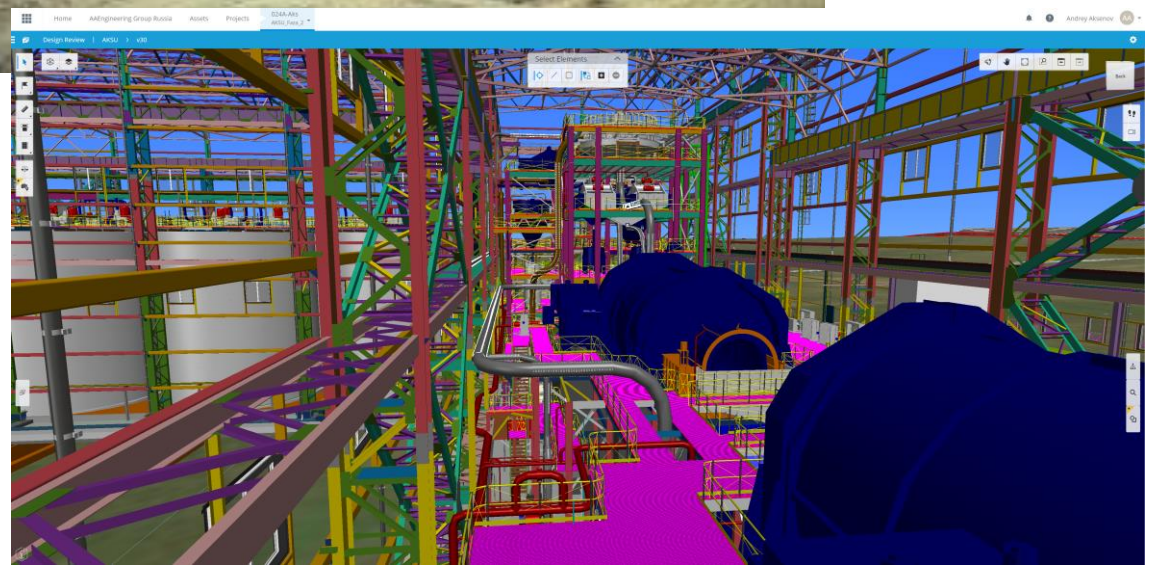
Project Playbook: LumenRT, MicroStation, Navigator, OpenBuildings Designer, OpenPlant, ProjectWise, STAAD

Set New Record for Production Ramp-up Time Through Use of a Complete Intelligent Digital Twin

12

Bentley

AAEngineering – Gold Processing Plant, Kazakhstan



- Processing plant, dam, worker camp, water pipelines, and electrical substation
- Digital twin from concept to startup
- 30% reduction in engineering time
- 75% reduction in travel to site by using drones for site surveys during COVID
- Operations being trained using digital twin

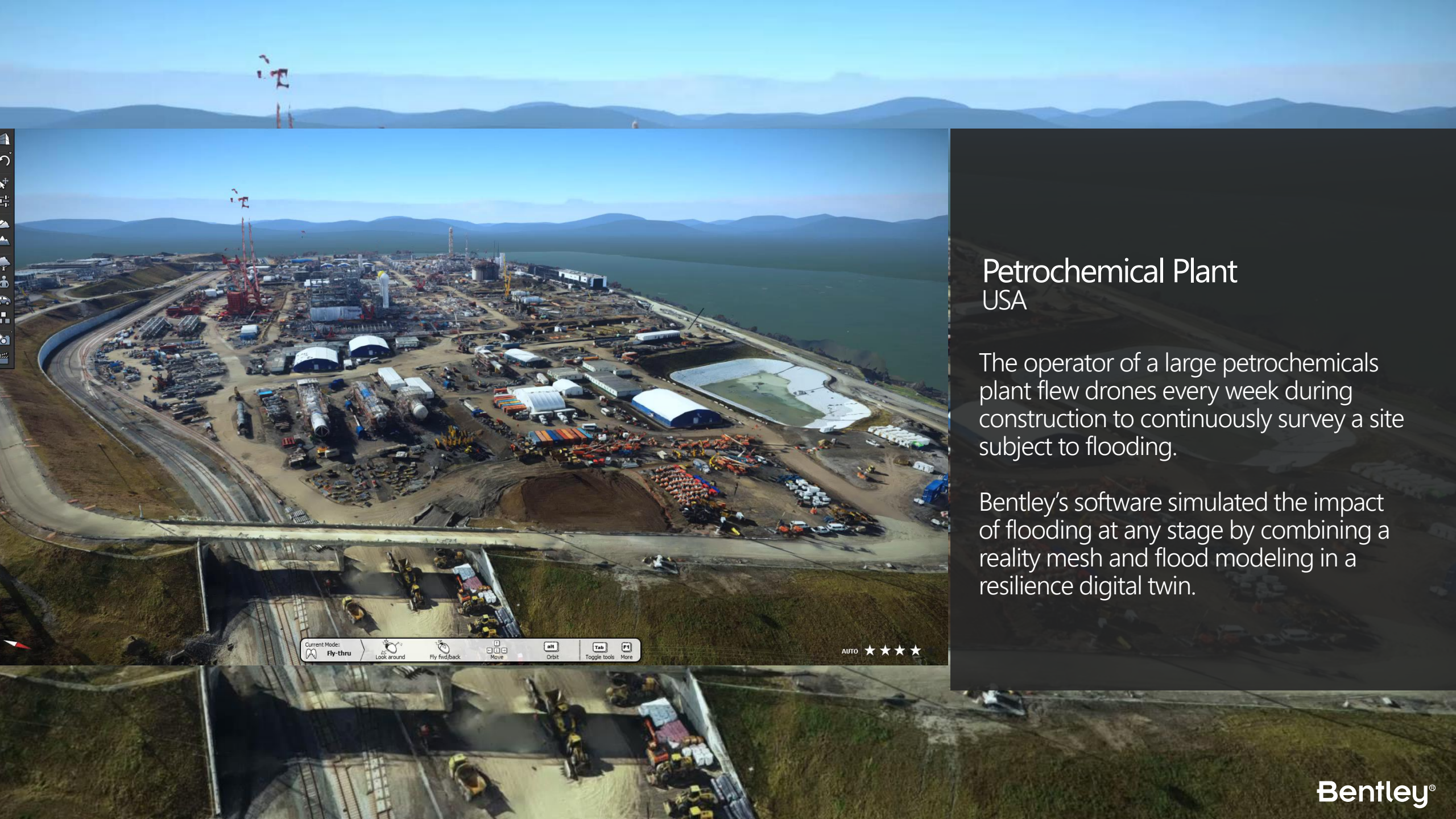
Project Playbook: AutoPIPE, Bentley Raceway and Cable Management, ContextCapture, gINT, iModel.js, iTwin Services, LumenRT, MicroStation, OpenBuildings Designer, OpenPlant, OpenRoads, OpenSite, PLAXIS, ProjectWise, Promis.e, ProStructures, SITEOPS, SYNCHRO 4D

Bentley

Digital Twins for Shell Deepwater Capital Projects

- Accelerating project delivery.
- A collaborative environment for everyone.
- Open integration, eliminating project inefficiencies.

Bentley®



Petrochemical Plant
USA

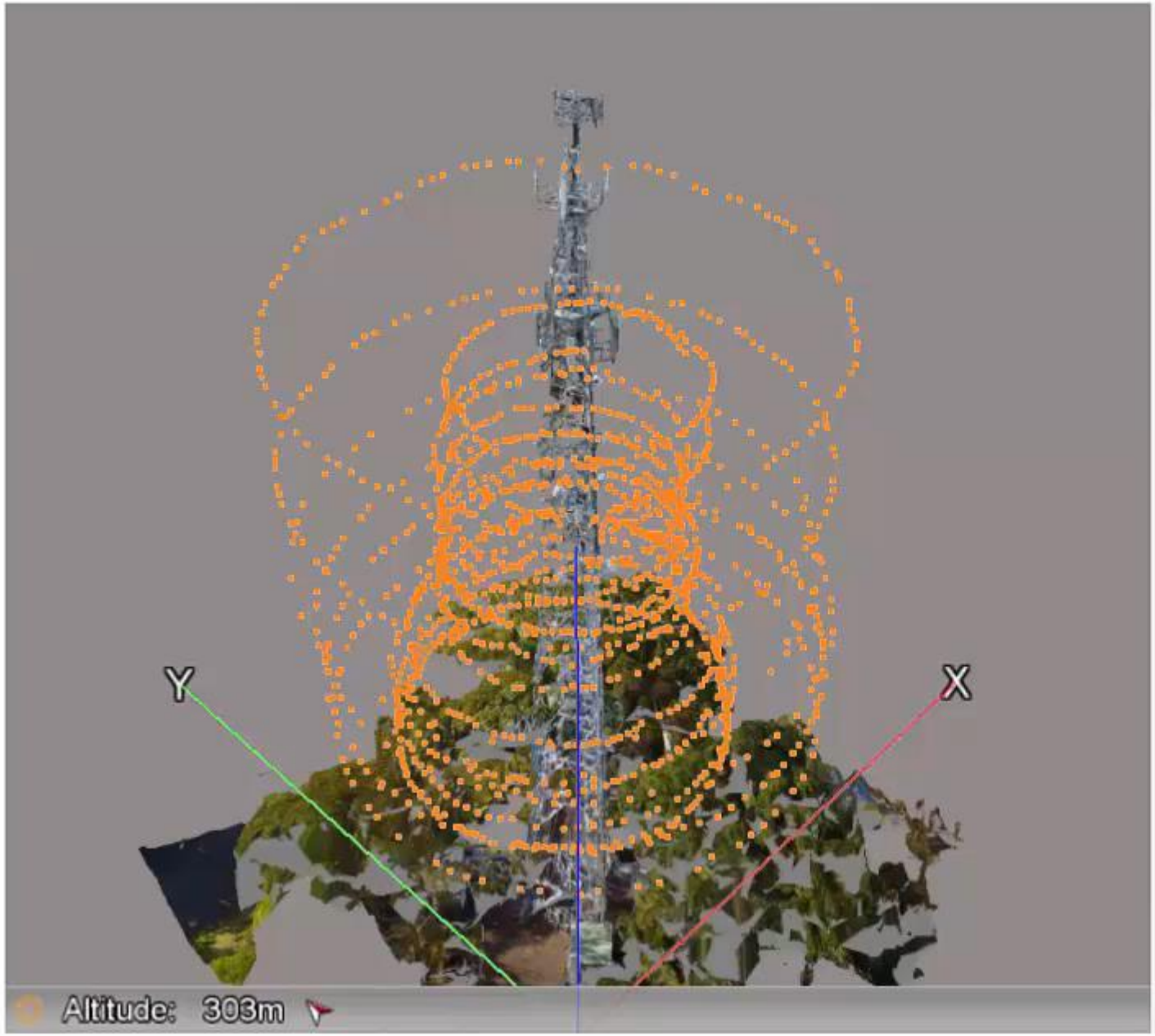
The operator of a large petrochemicals plant flew drones every week during construction to continuously survey a site subject to flooding.

Bentley's software simulated the impact of flooding at any stage by combining a reality mesh and flood modeling in a resilience digital twin.

Bentley®

General | Photos | Control points | Tie points | Additional data | 3D view

Show photos: Without component | Camera size



Photo

Name	
Directory	
Date taken	
Size	
Mask file	
Component	

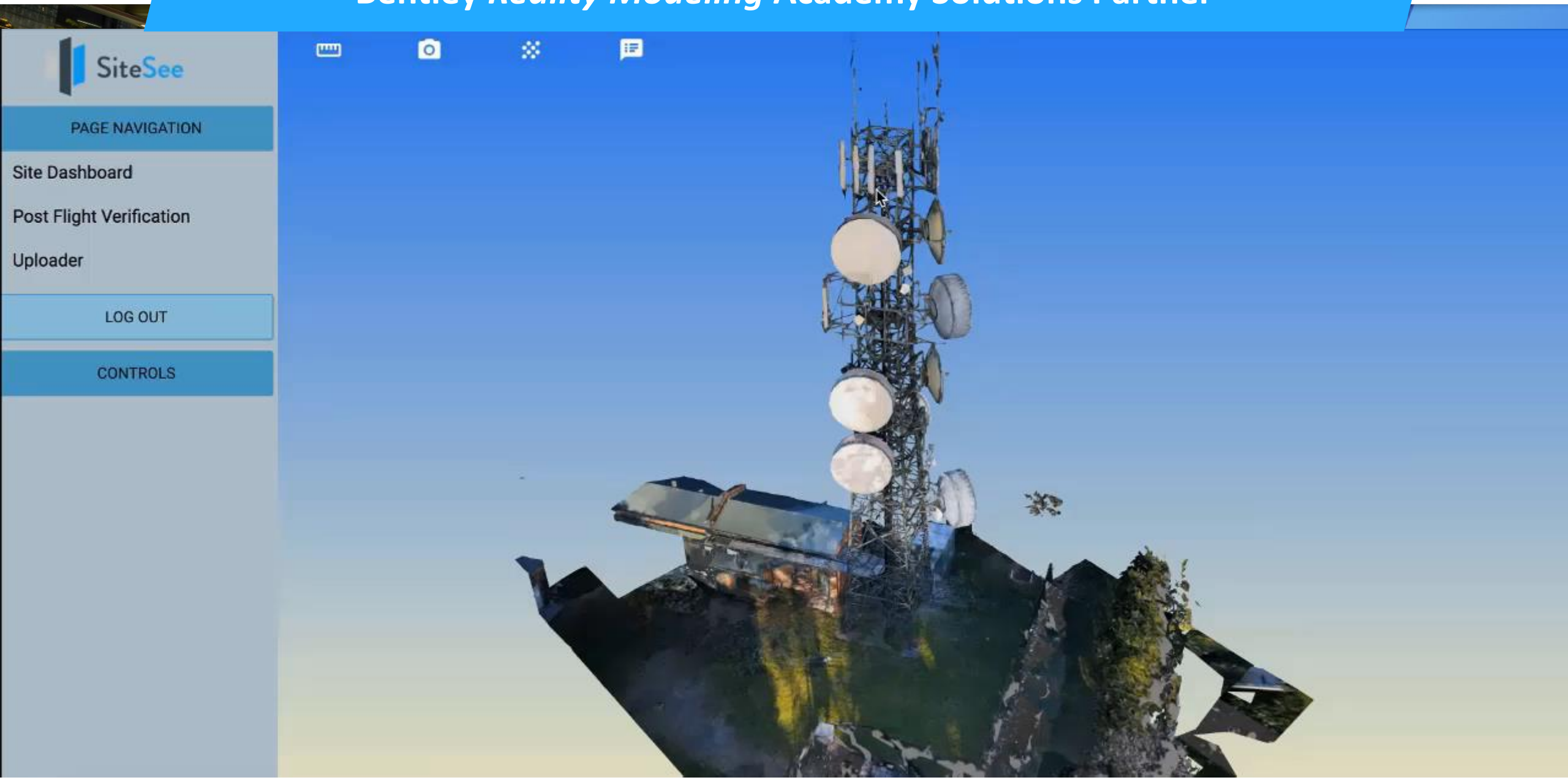
Pose

Spatial reference system: WGS 84 (EPSG:4326)

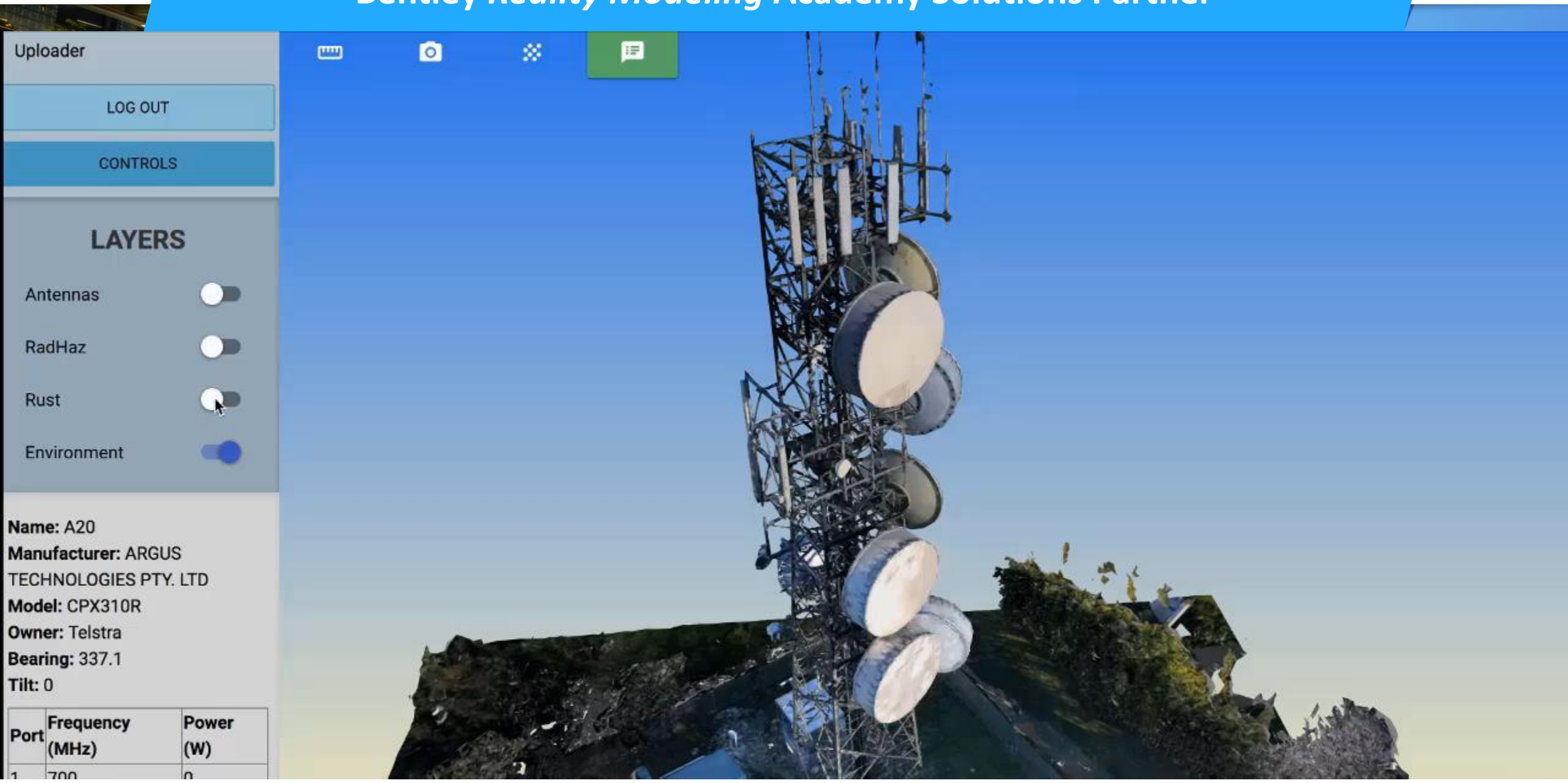
Position X	
Y	
Z	
Rotation	

AERO LENS

Bentley *Reality Modeling* Academy Solutions Partner

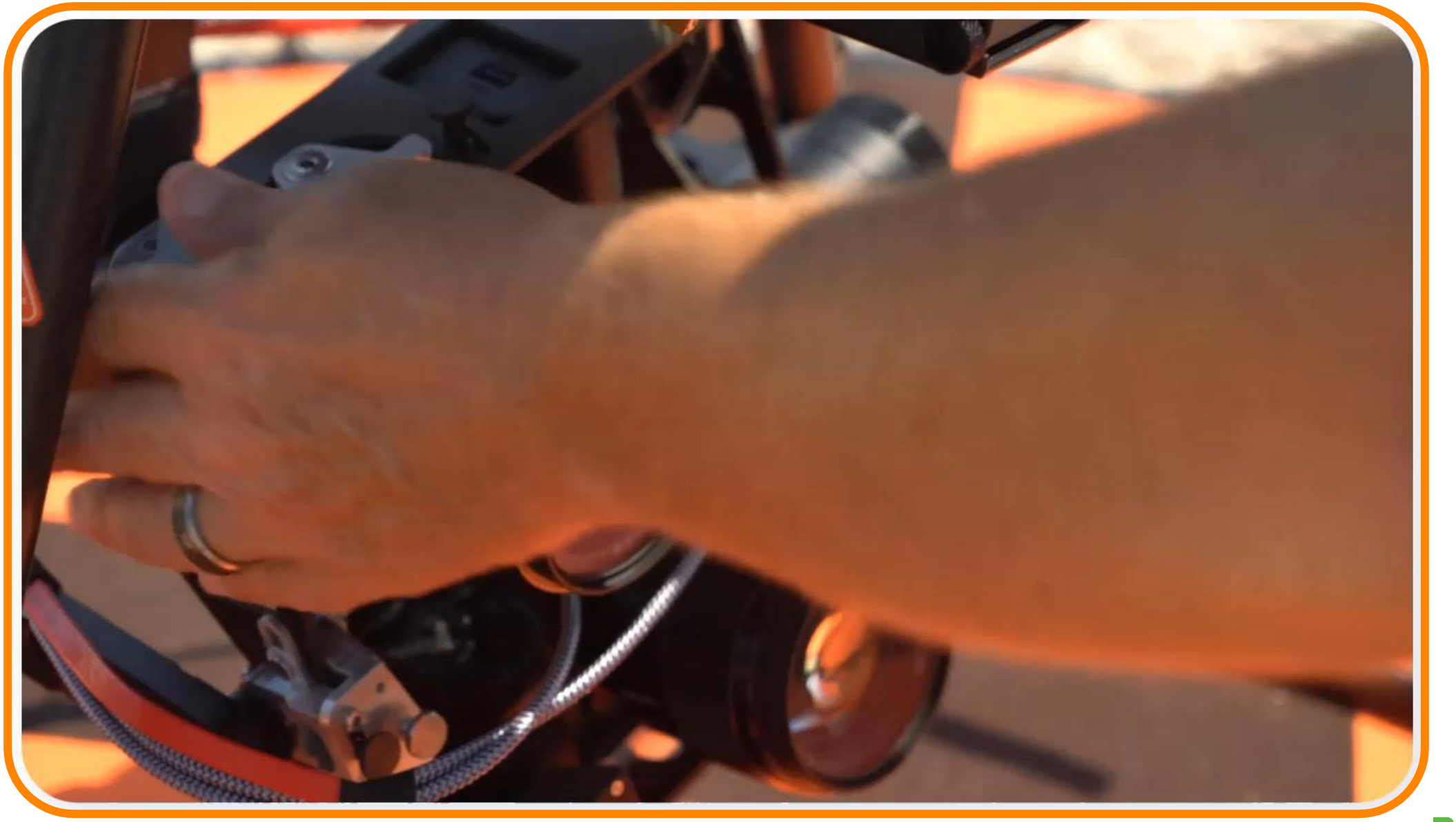


Bentley *Reality Modeling* Academy Solutions Partner



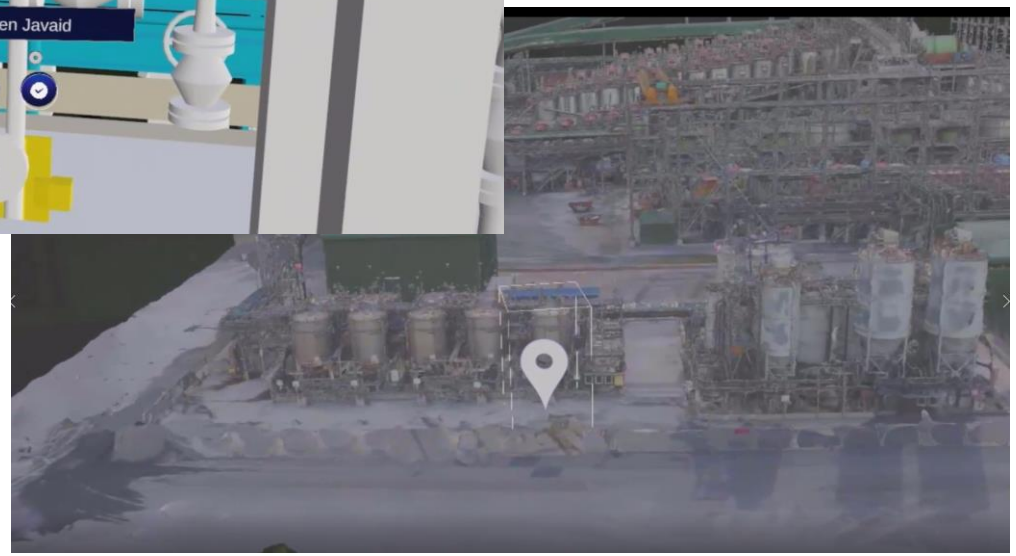
Communications Towers' *Digital Context*

Courtesy of Visual Intelligence



Bentley

RocketMine, Mining Operation, South Africa



- Process plant digital twin used for inspections & maintenance
- Working onsite having all data to hand
- Working remotely and seeing facility as reality model
- Easily feed back and collaborate on issues

Project Playbook: ContexCapture, PlantSight, HoloLens

Bentley

Digital twins for the Process Industries Q&A

Anne-Marie.Walters@Bentley.Com

Bentley®
Advancing Infrastructure