Going Digital

Jarek Sitek – Bentley Systems

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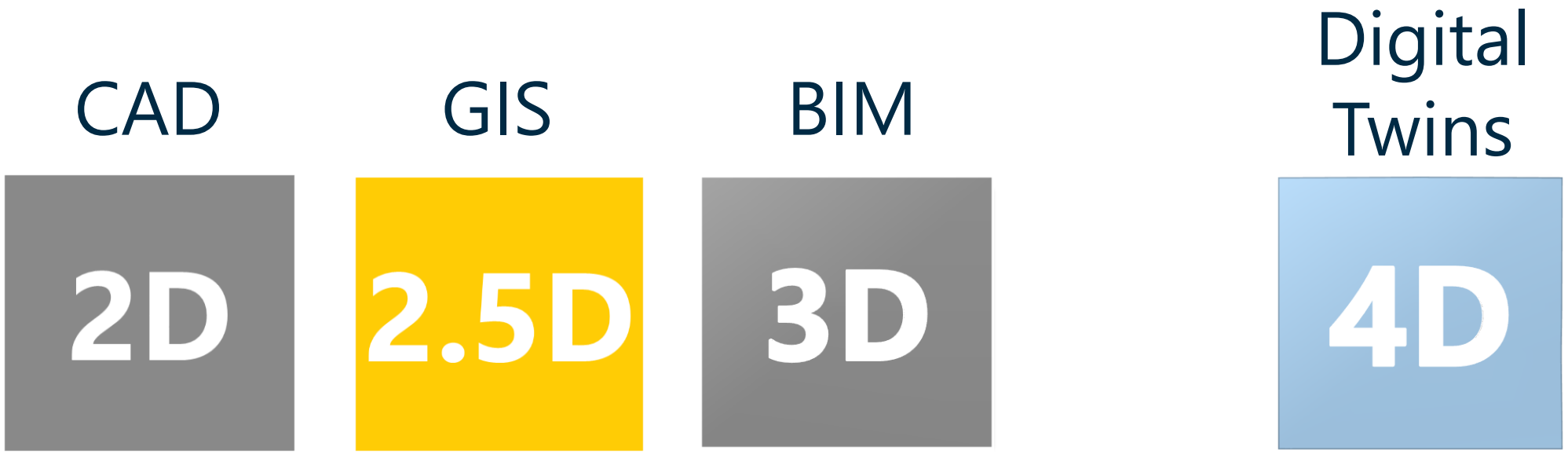
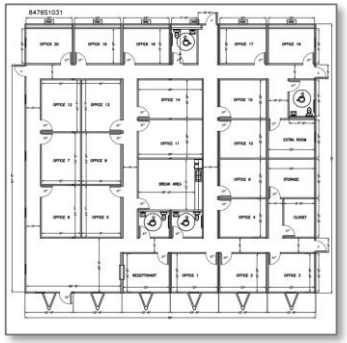

CAD
GIS
BIM
Digital Twins
2D
2.5D
3D
4D

CAD

2D

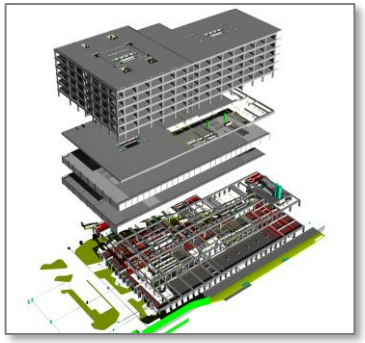


GIS

2.5D

BIM

3D



("Static") Deliverables

Digital Twins

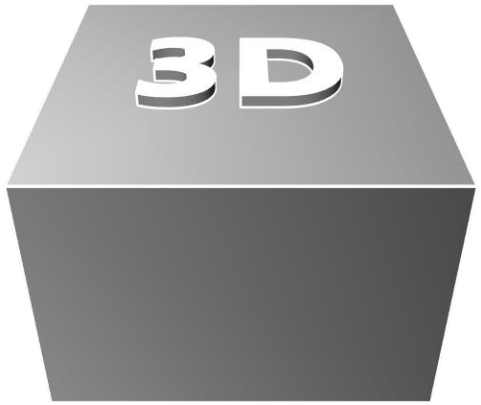
4D

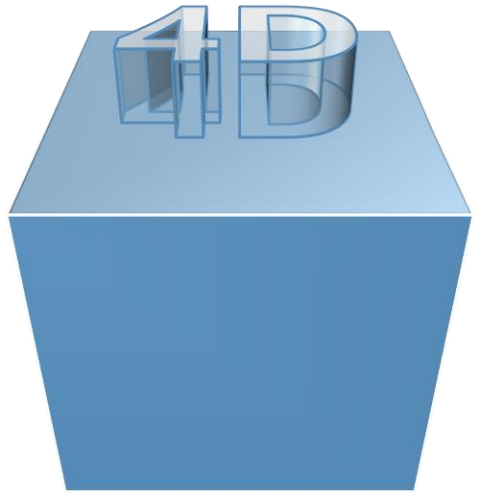
Change Synchronization

Immersive Visualization

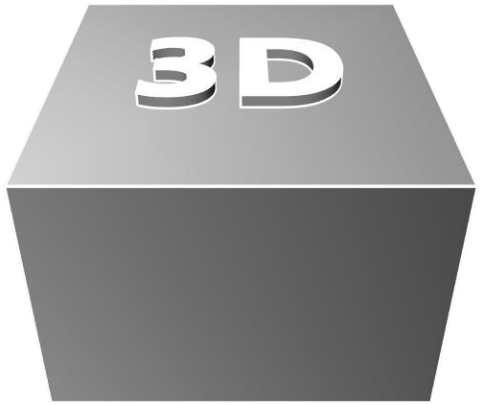
Analytics Visibility

"Evergreen" Visibility





MAY JUN JUL AUG SEP OCT



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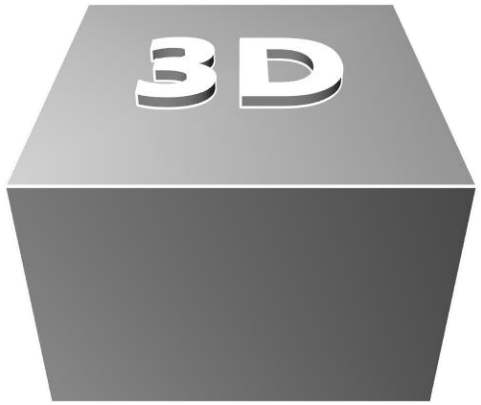

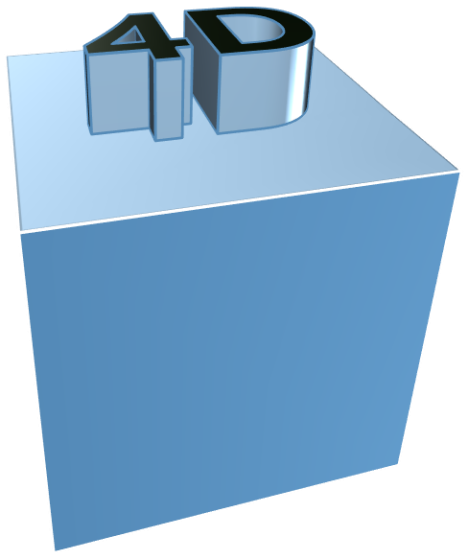

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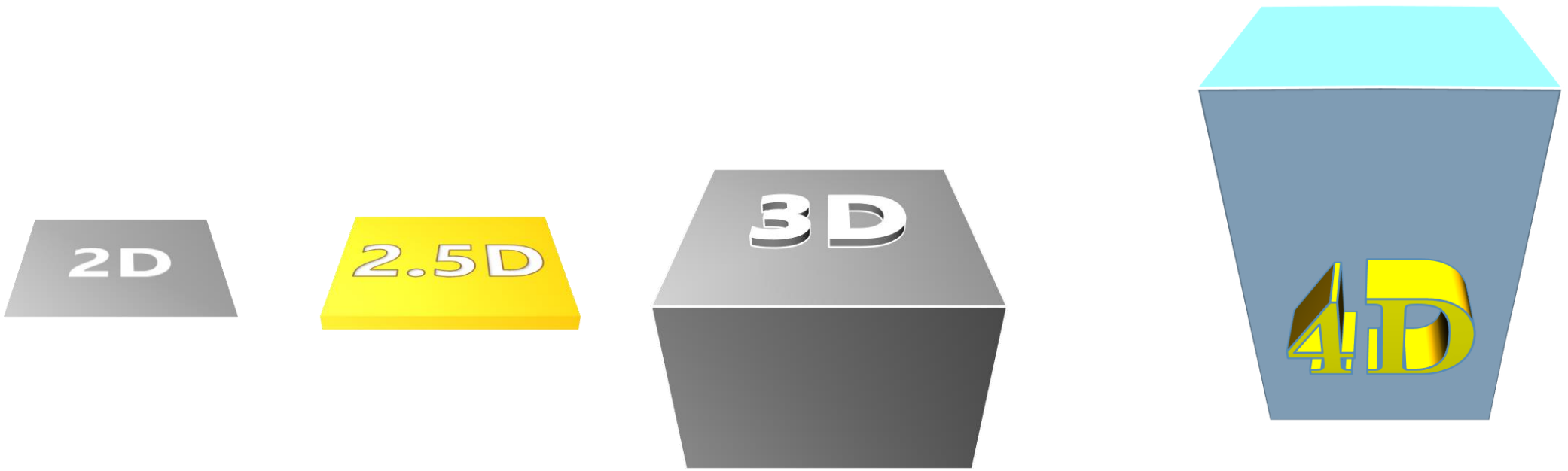

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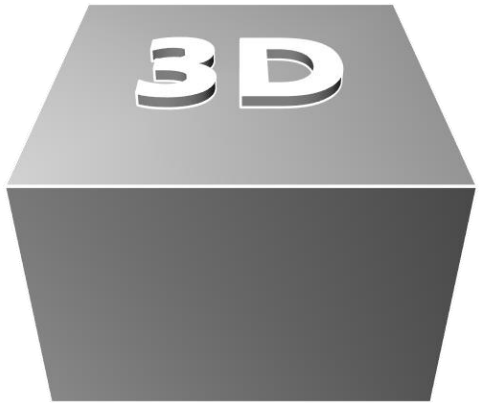

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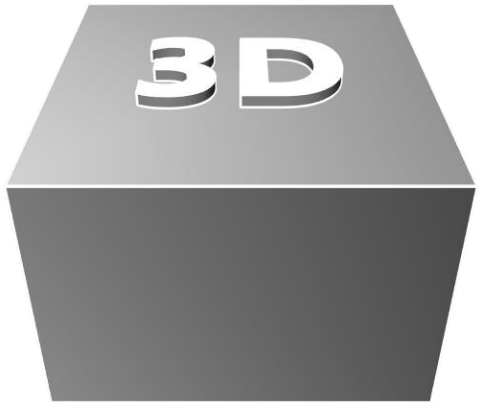

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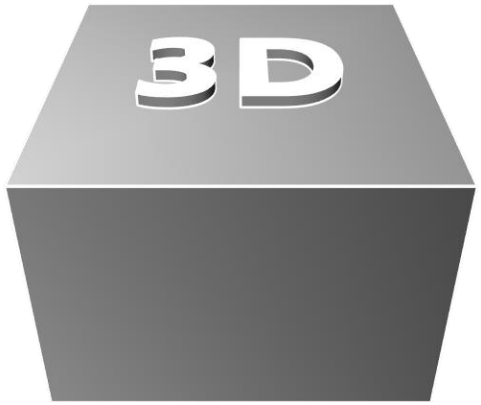

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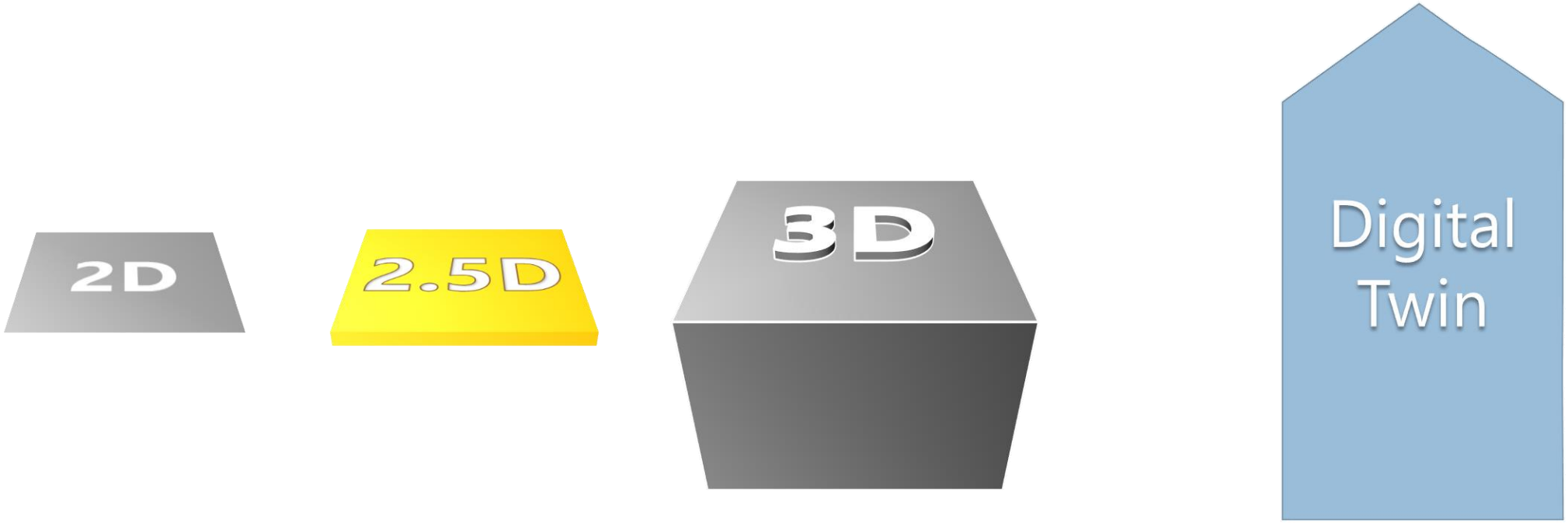
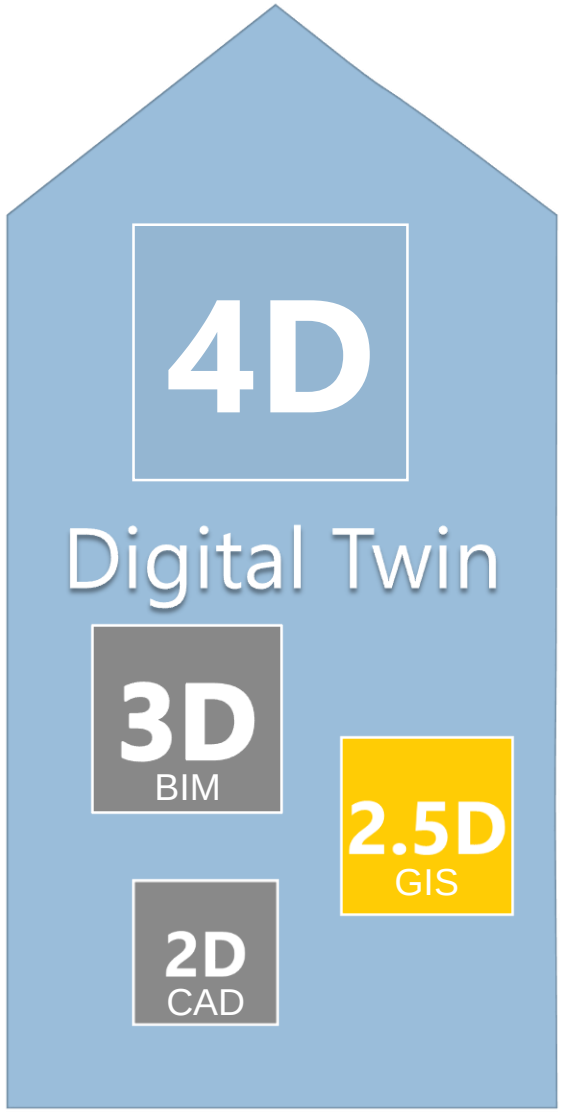
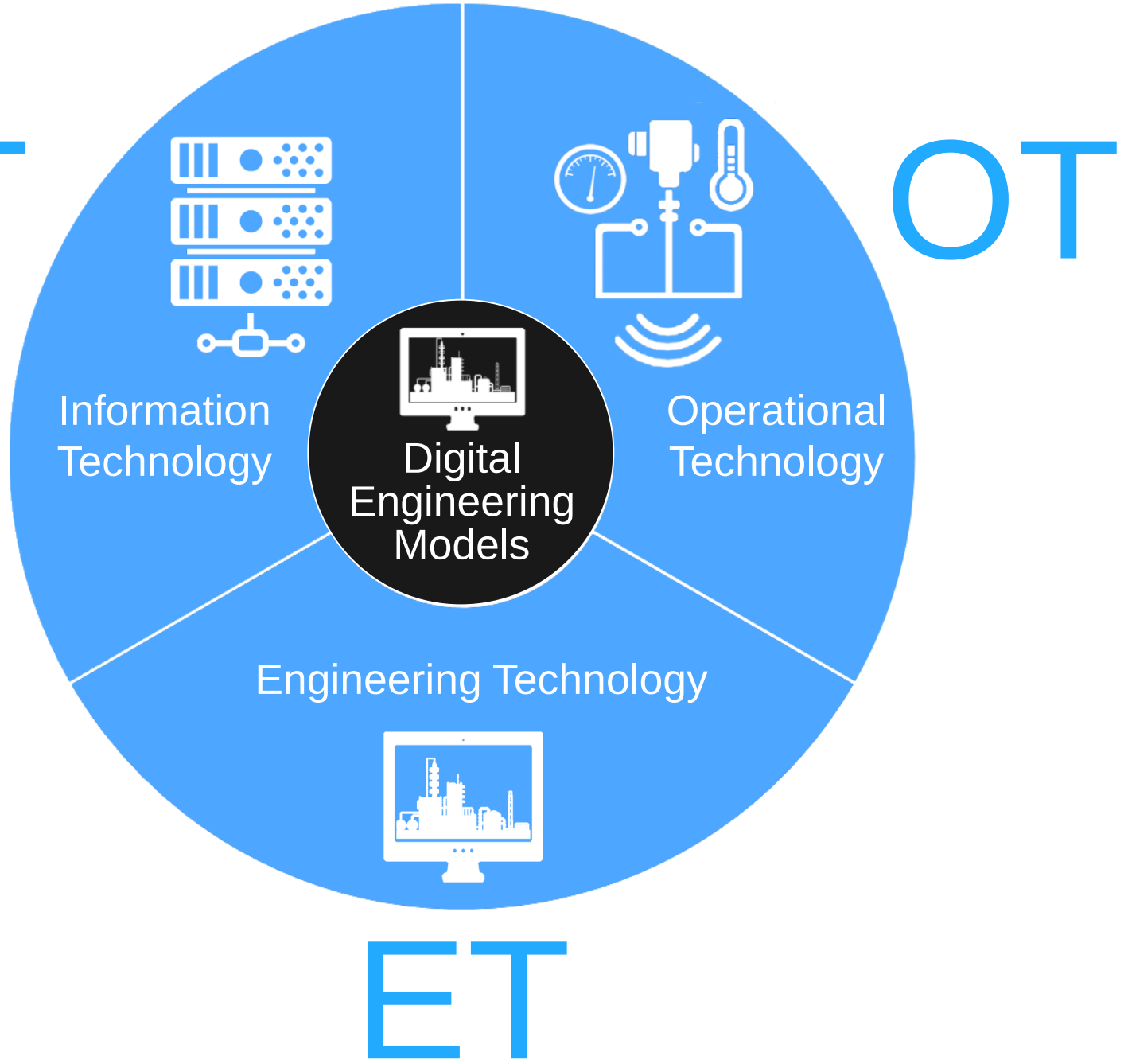

2D
2.5D
3D
Digital
Twin


4D
Digital Twin
3D
BIM
2.5D
GIS
2D
CAD

As presented at the
ARC STRATEGY FORUM
"IT/OT Convergence: Linking Legacy to an Industrial Internet of Things World"
February, 2016



Going Digital…

Gartner

Innovation Insight for Engineering Technology: Why ET, IT and OT Are More Than the Sum of Their Parts

Published: 27 August 2019 **ID:** G00382466

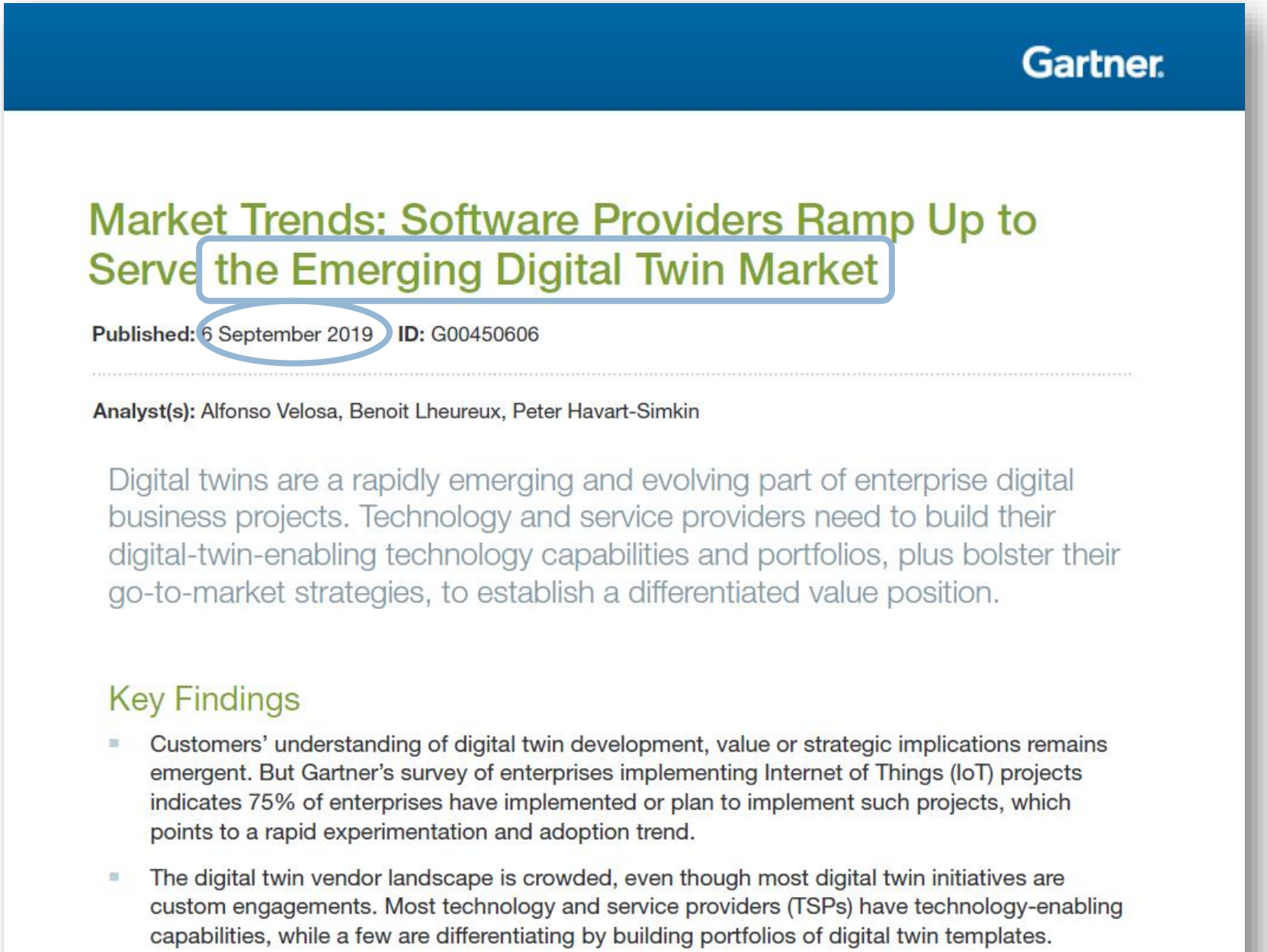
Analyst(s): Kristian Steenstrup, Marc Halpern

CIOs must understand engineering technology as well as OT and IT, and the connections between the three to guide their companies' journeys toward achieving digital business goals such as Industrie 4.0. This research explains why and provides guidance on how to begin embracing ET.

Key Findings

- Few CIOs engage in selecting or supporting engineering technology (ET) platforms, despite their importance to operational technology (OT) and IT deployments.
- ET portfolios rank among the oldest legacy technology portfolios and need modernization in manufacturing industries and asset-intensive industries.
- Investments in modern ET are growing and becoming a bigger part of technology portfolios in

Going Digital *(Twins!)*



Gartner.

Market Trends: Software Providers Ramp Up to Serve the Emerging Digital Twin Market

Published: 6 September 2019 **ID:** G00450606

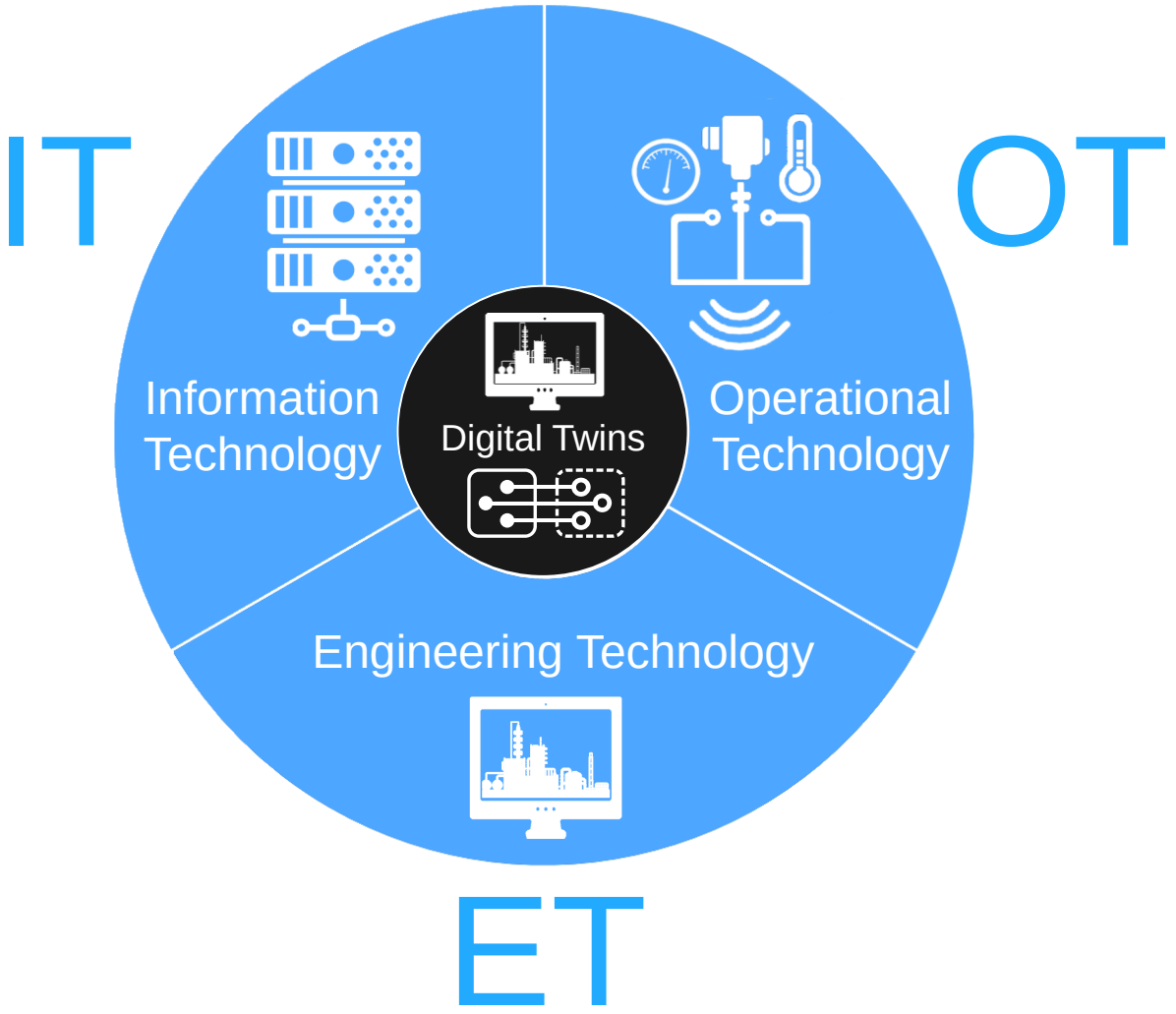
Analyst(s): Alfonso Velosa, Benoit Lheureux, Peter Havart-Simkin

Digital twins are a rapidly emerging and evolving part of enterprise digital business projects. Technology and service providers need to build their digital-twin-enabling technology capabilities and portfolios, plus bolster their go-to-market strategies, to establish a differentiated value position.

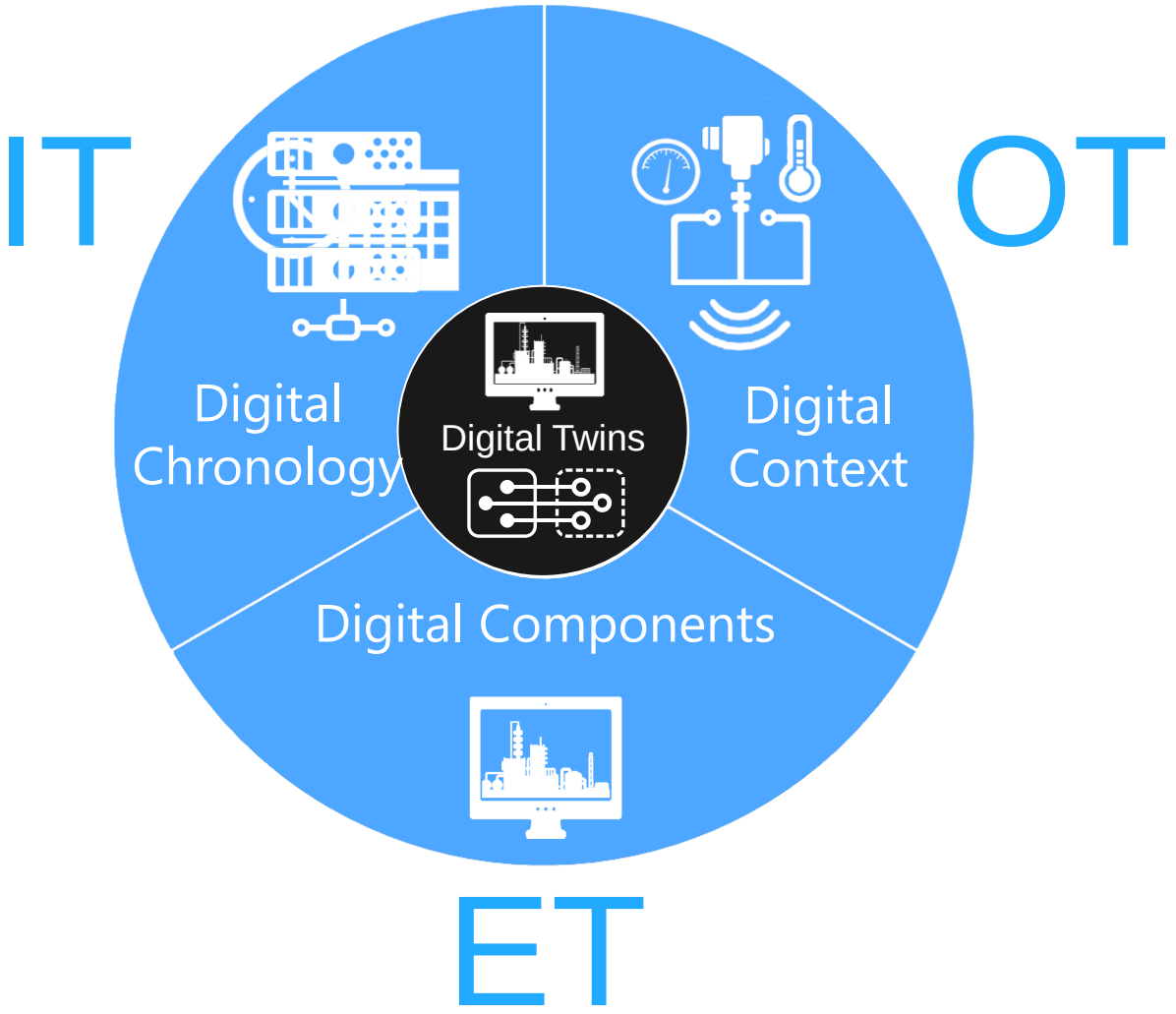
Key Findings

- Customers' understanding of digital twin development, value or strategic implications remains emergent. But Gartner's survey of enterprises implementing Internet of Things (IoT) projects indicates 75% of enterprises have implemented or plan to implement such projects, which points to a rapid experimentation and adoption trend.
- The digital twin vendor landscape is crowded, even though most digital twin initiatives are custom engagements. Most technology and service providers (TSPs) have technology-enabling capabilities, while a few are differentiating by building portfolios of digital twin templates.

Going Digital: *(Twins!)*

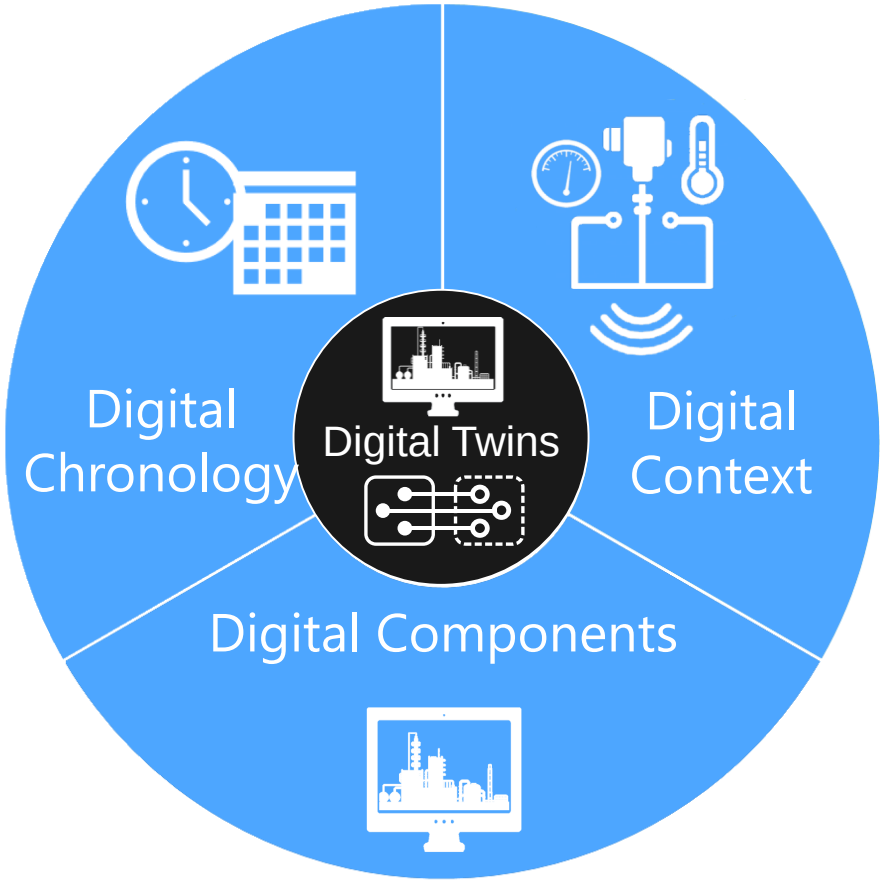


Going Digital: *(Twins!)*



Going Digital (*Twins!*)

iTwin Services
4D Simulation



Reality Modeling

Design Integration
Machine Learning

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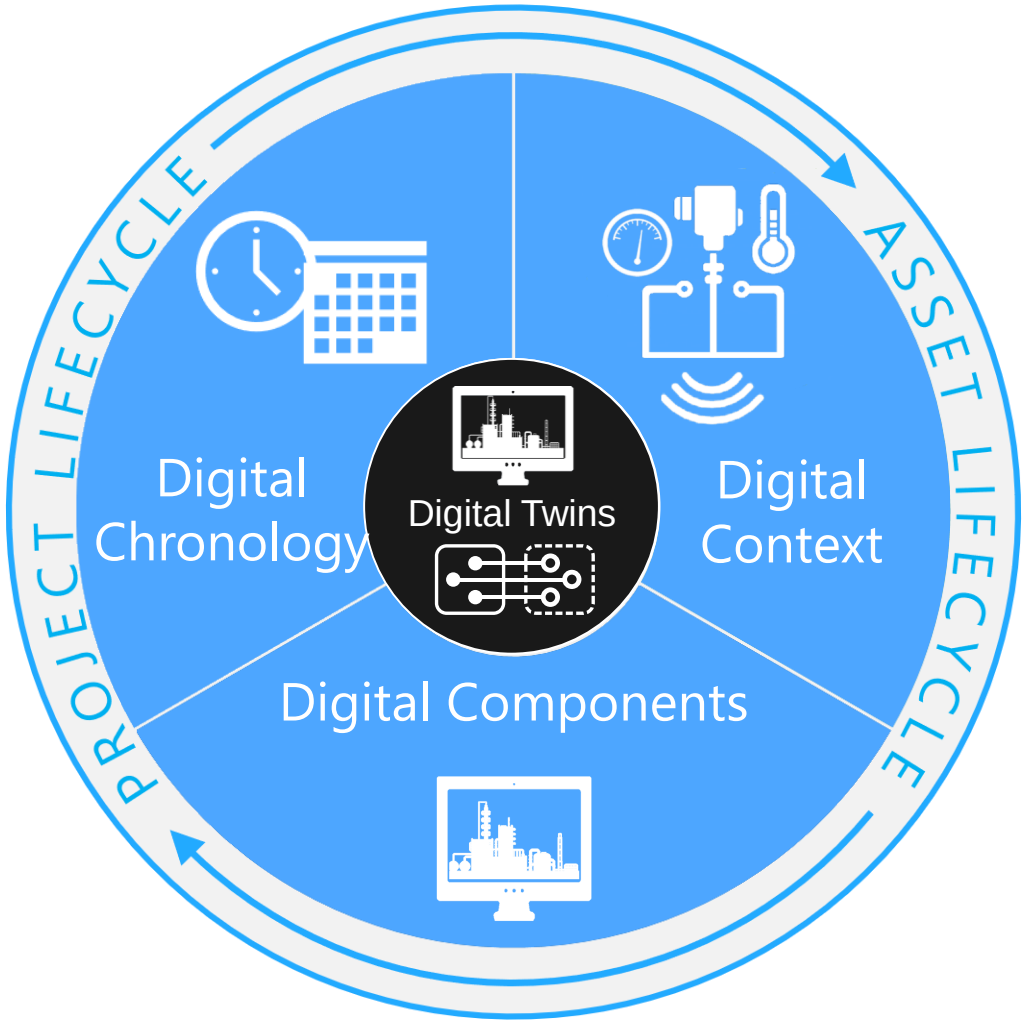

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Project Delivery

ARC Advisory Group

Engineering Design Tools for Plants, Infrastructure, and BIM 2018 to 2023
August, 2019

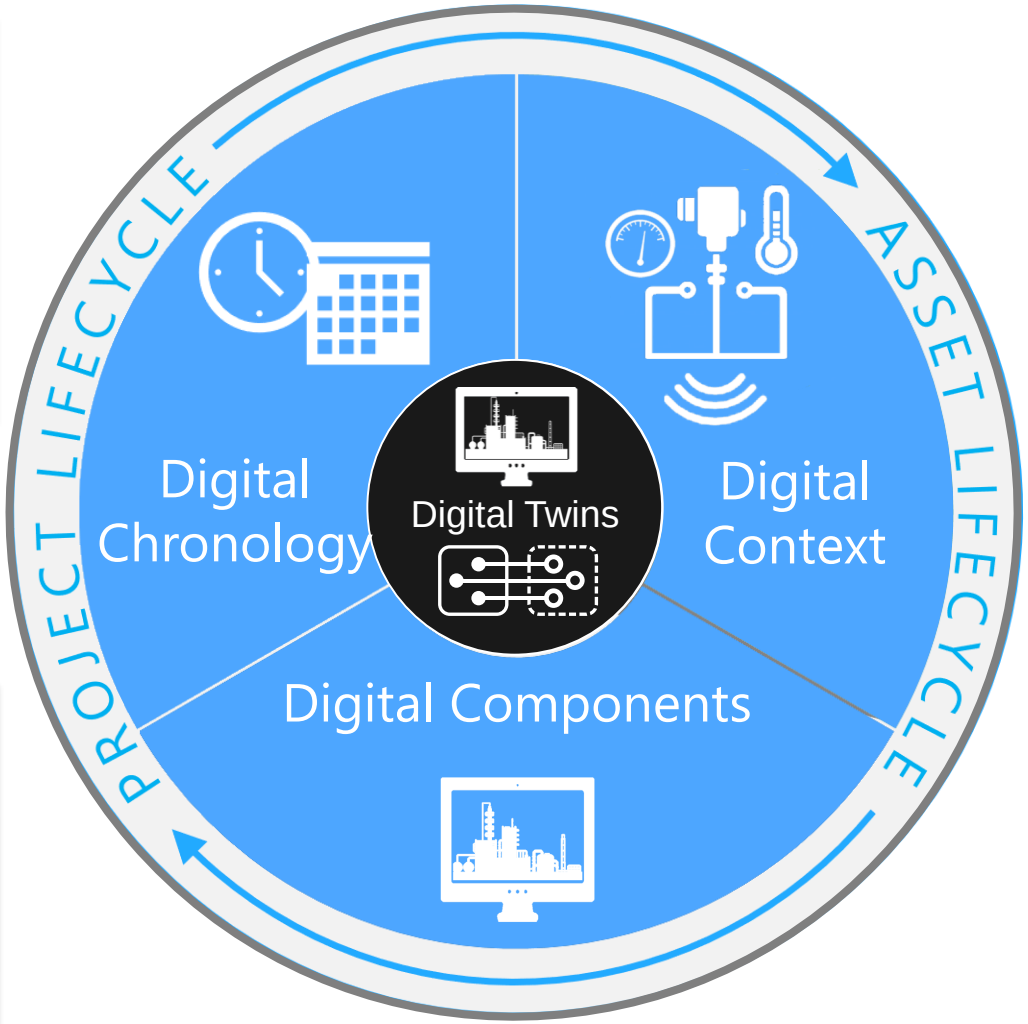
#1 in Collaborative BIM

Design Integration

ARC Advisory Group

Engineering Design Tools for Plants, Infrastructure, and BIM 2018 to 2023
August, 2019

#2 Overall
#1 in Electric T&D, Communications
#1 in Water/Wastewater Distribution



Asset and Network Performance

ARC Advisory Group

Asset Reliability Software
October, 2019

#1 Overall
#1 in Electric Power T&D
#1 in Oil & Gas
#1 in Transportation

Digital Cities

*"Bentley Systems is one of the **top 25** companies in terms of **Azure usage globally** in 2019."*

Microsoft

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Plant

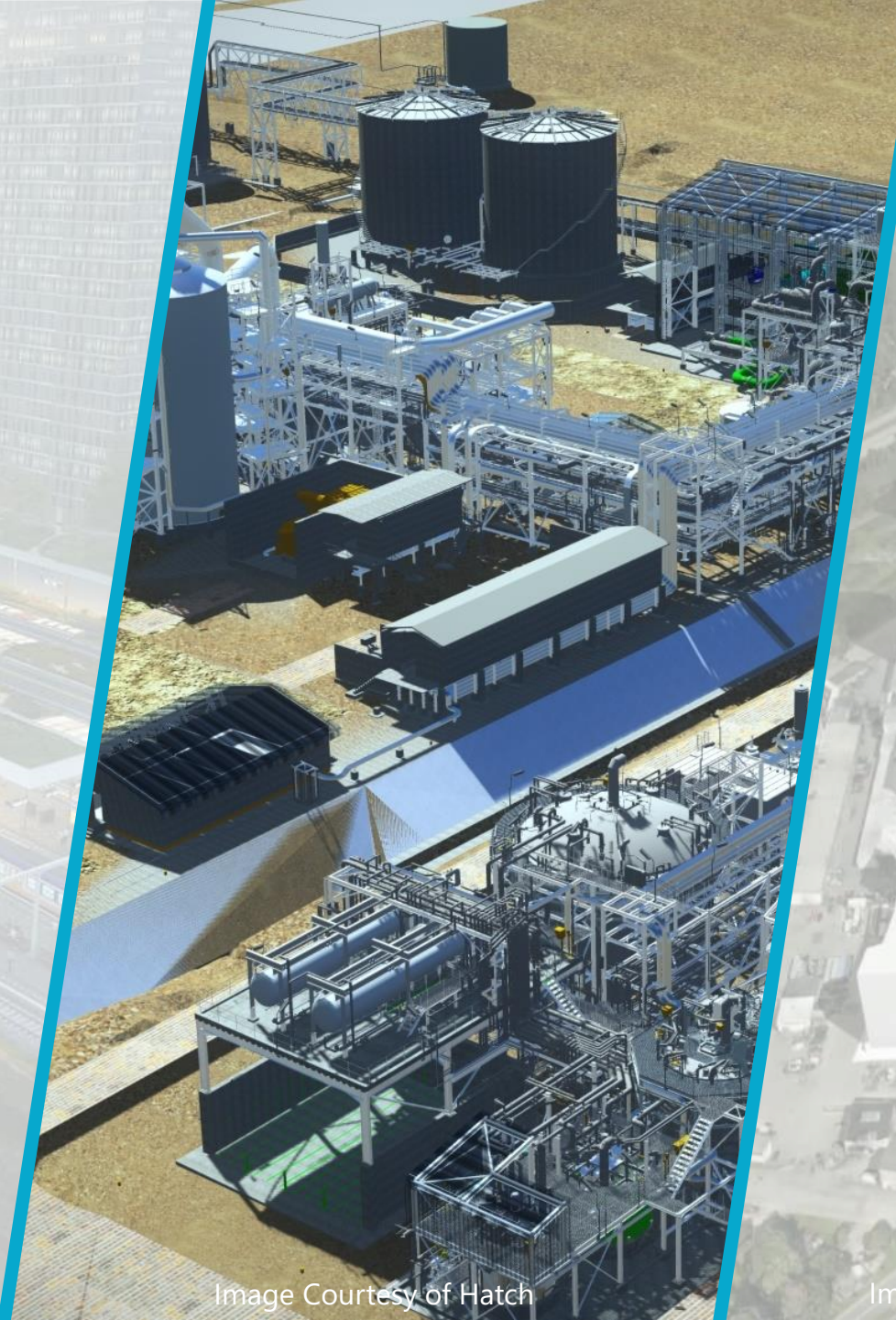

Image Courtesy of Sweco

Image Courtesy of Hatch

Image Courtesy of Gothenburg City

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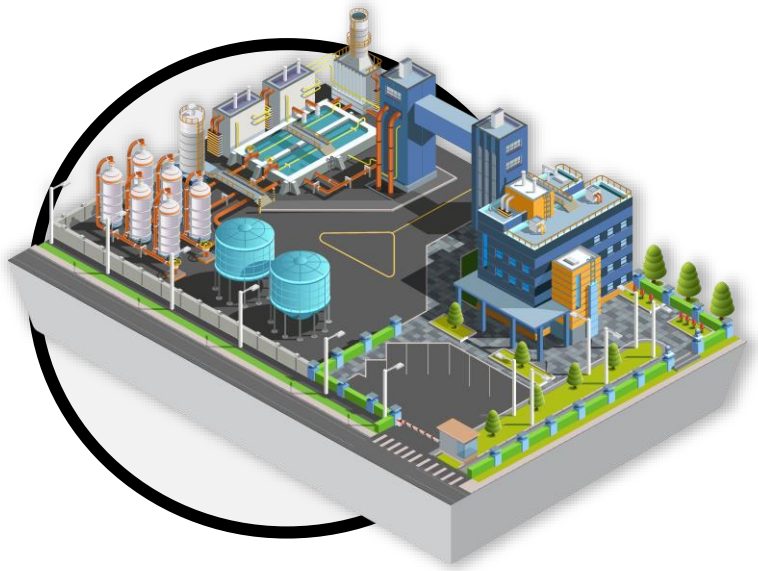
Physical Asset



Digital Twins

- OpenPlant helps create and maintain digital twins during design stage of project lifecycle
- Source of truth for project data
- Accessible by other applications

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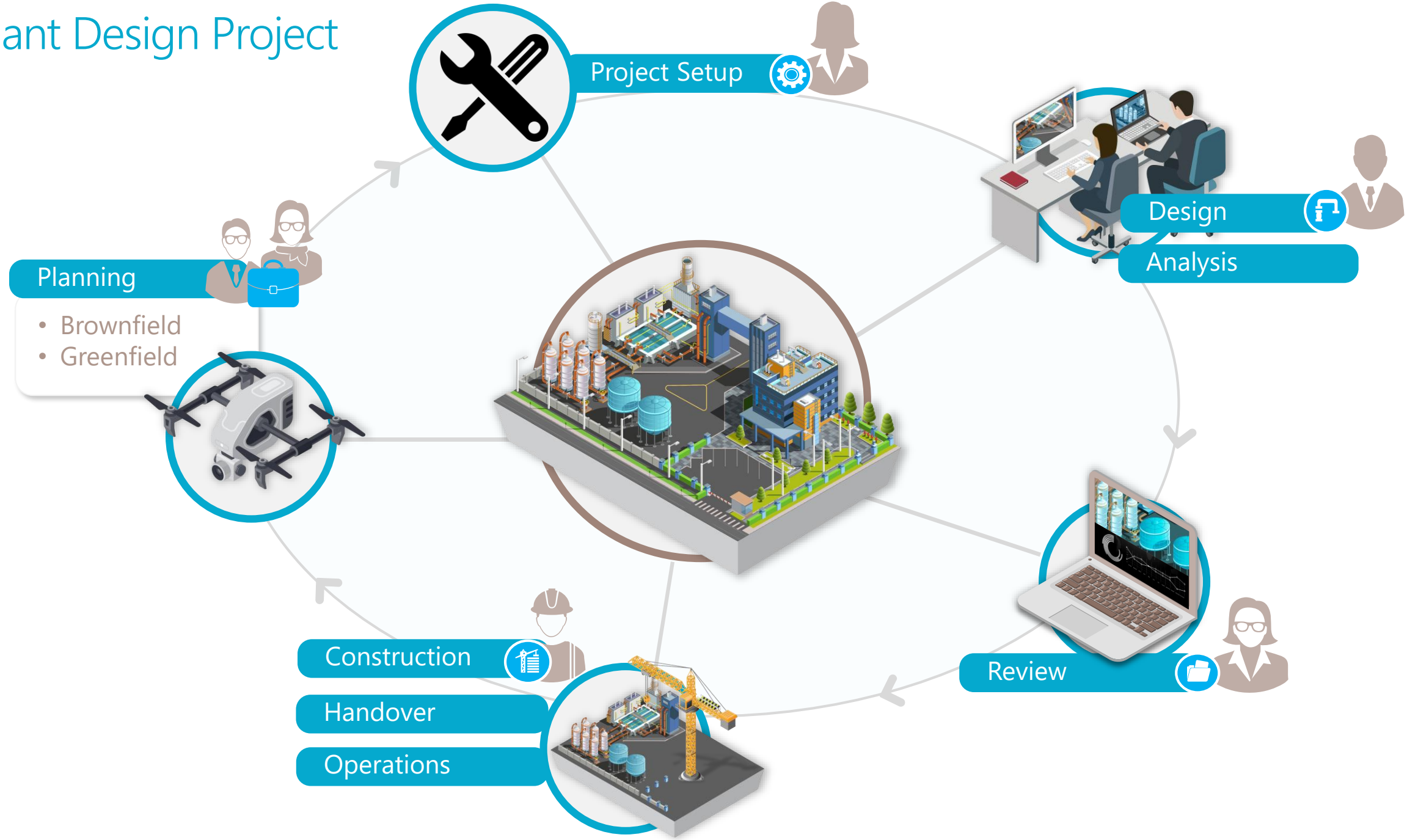
Plant Design Project



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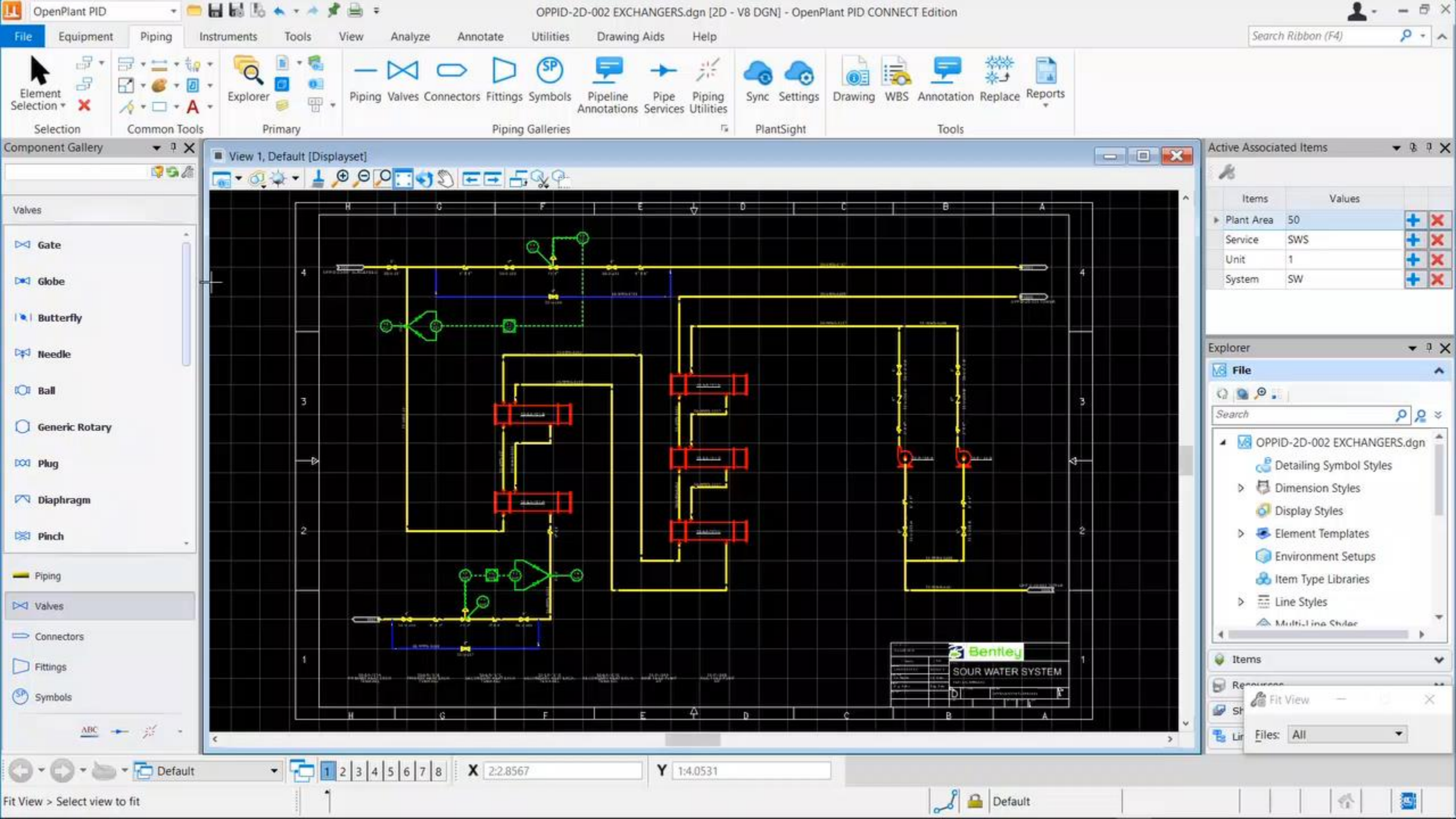
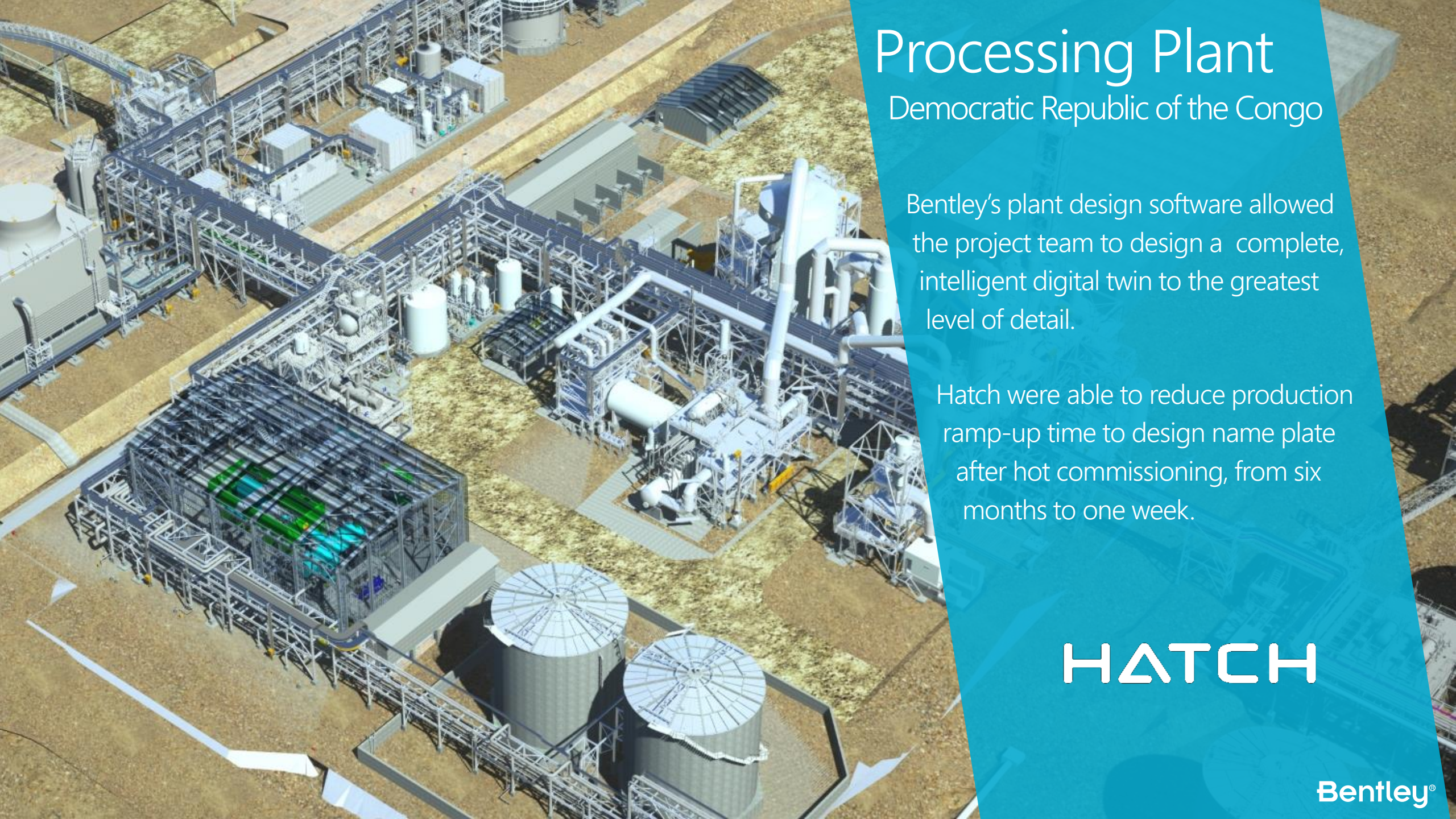

OpenPlant PID
OPPID-2D-002 EXCHANGERS.dgn [2D - V8 DGN] - OpenPlant PID CONNECT Edition
File
Equipment
Piping
Instruments
Tools
View
Analyze
Annotate
Utilities
Drawing Aids
Help
Search Ribbon (F4)
Element Selection
Selection
Common Tools
Explorer
Primary
Piping
Valves
Connectors
Fittings
Symbols
Pipeline Annotations
Pipe Services
Piping Utilities
Piping Galleries
Sync
Settings
PlantSight
Drawing
WBS
Annotation
Replace
Reports
Tools
Component Gallery
Valves
Gate
Globe
Butterfly
Needle
Ball
Generic Rotary
Plug
Diaphragm
Pinch
Piping
Valves
Connectors
Fittings
Symbols
View 1, Default [Displayset]
Bentley
SOUR WATER SYSTEM
Active Associated Items
Items
Values
Plant Area
50
Service
SWS
Unit
1
System
SW
Explorer
File
Search
OPPID-2D-002 EXCHANGERS.dgn
Detailing Symbol Styles
Dimension Styles
Display Styles
Element Templates
Environment Setups
Item Type Libraries
Line Styles
Items
Fit View
Files:
All
Default
X
2:2.8567
Y
1:4.0531
Fit View > Select view to fit
Default



Processing Plant

Democratic Republic of the Congo

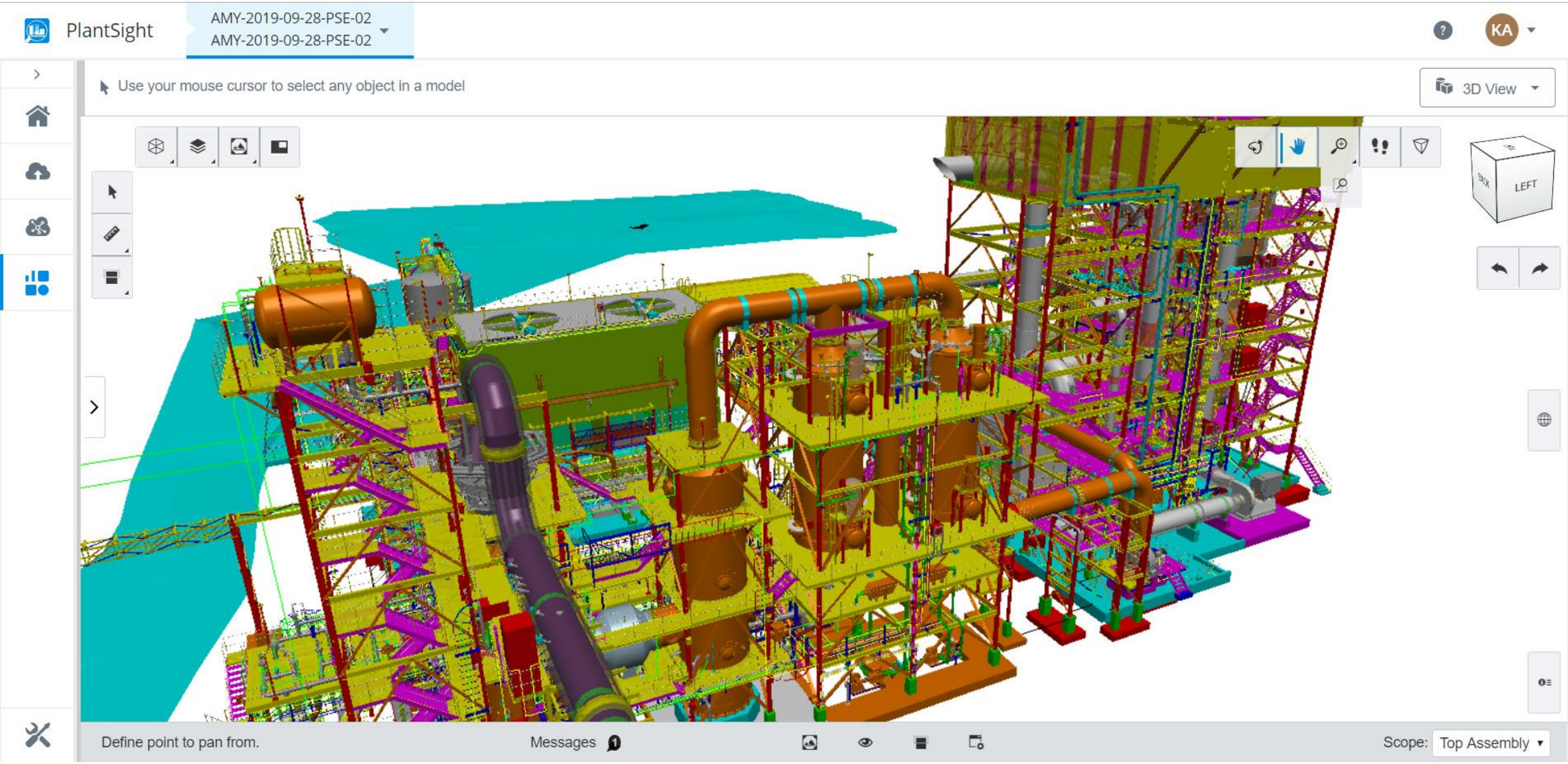
Bentley's plant design software allowed the project team to design a complete, intelligent digital twin to the greatest level of detail.

Hatch were able to reduce production ramp-up time to design name plate after hot commissioning, from six months to one week.

HATCH

Bentley®

Bentley
Advancing Infrastructure



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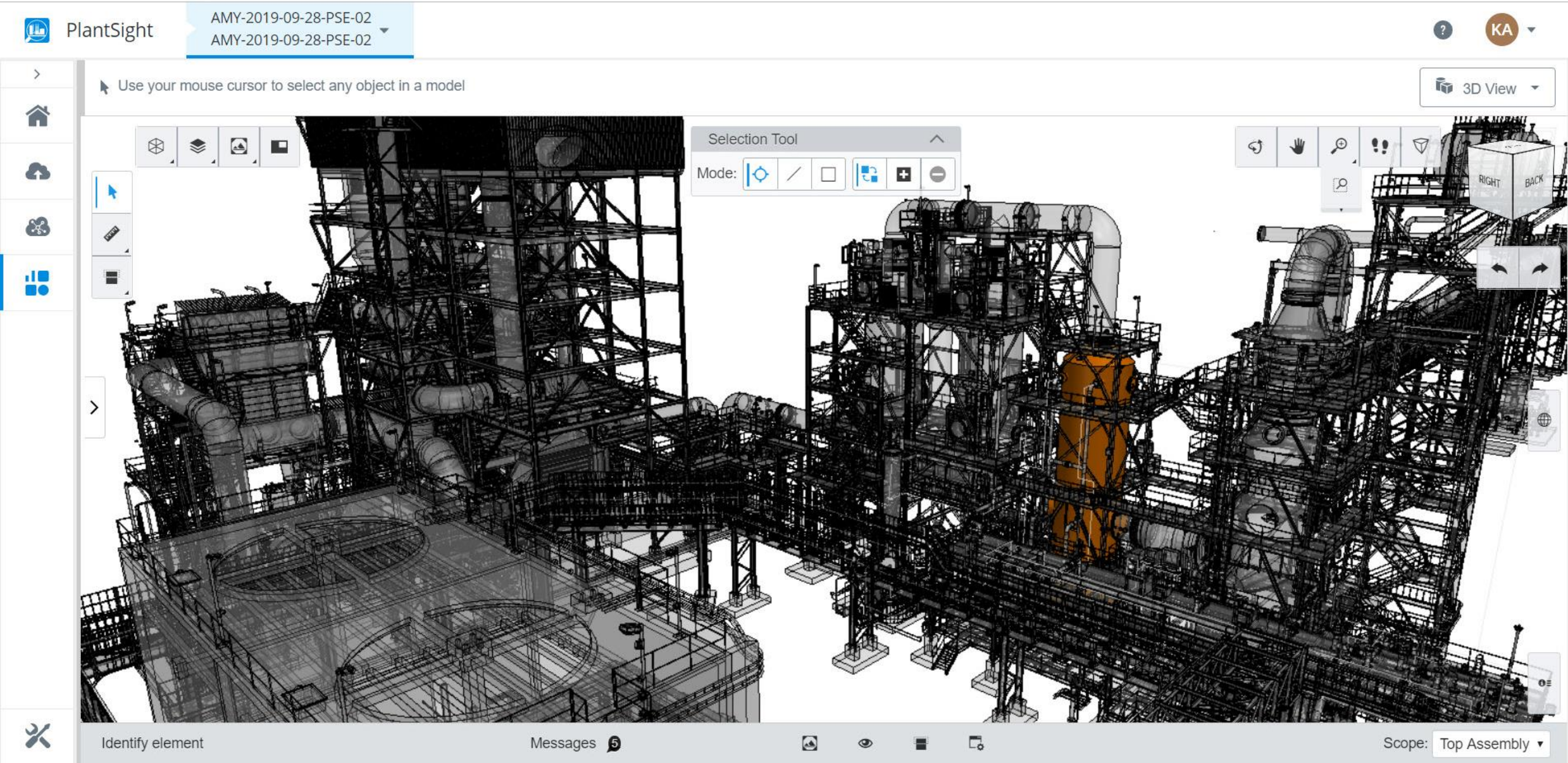

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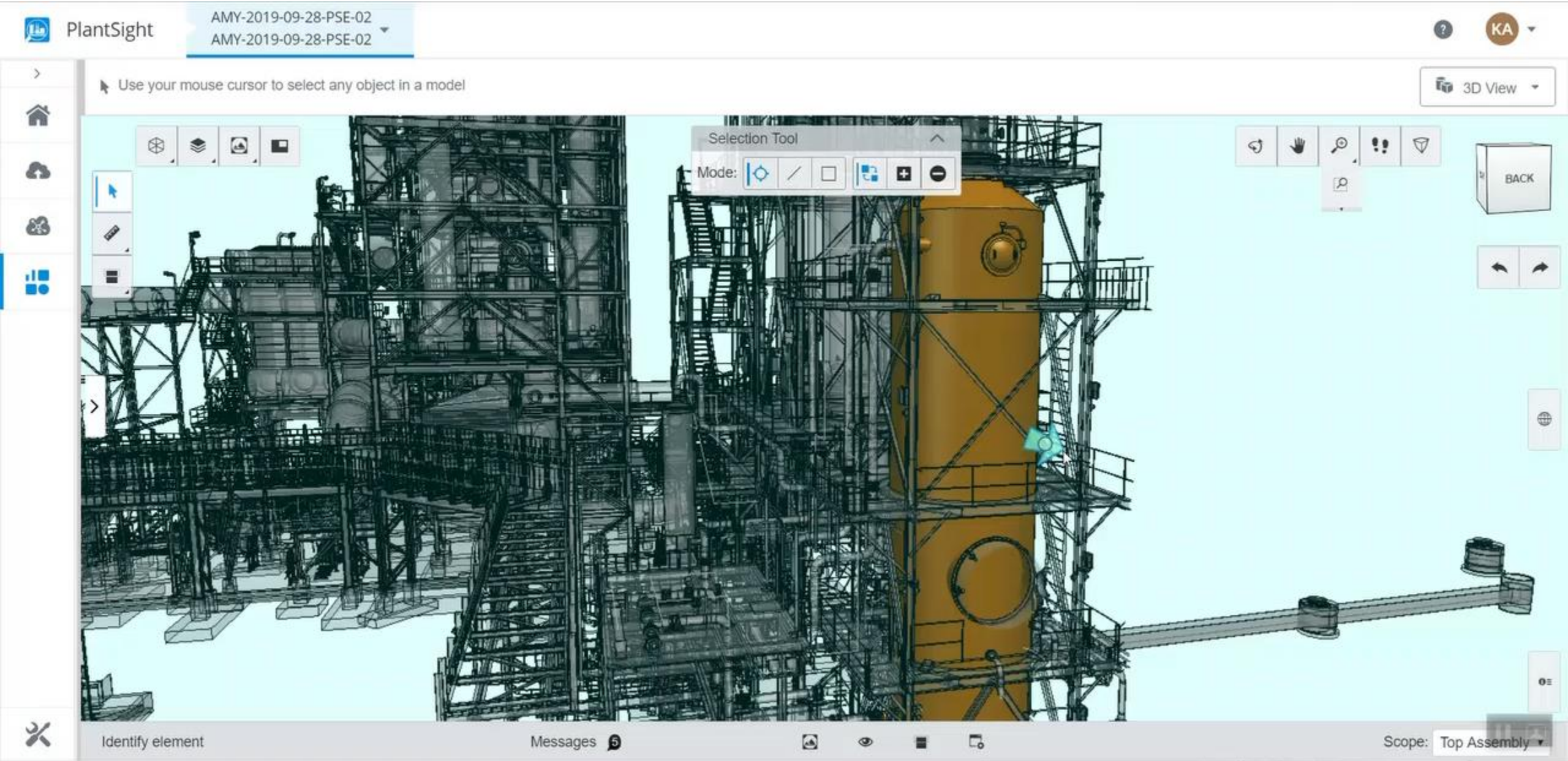

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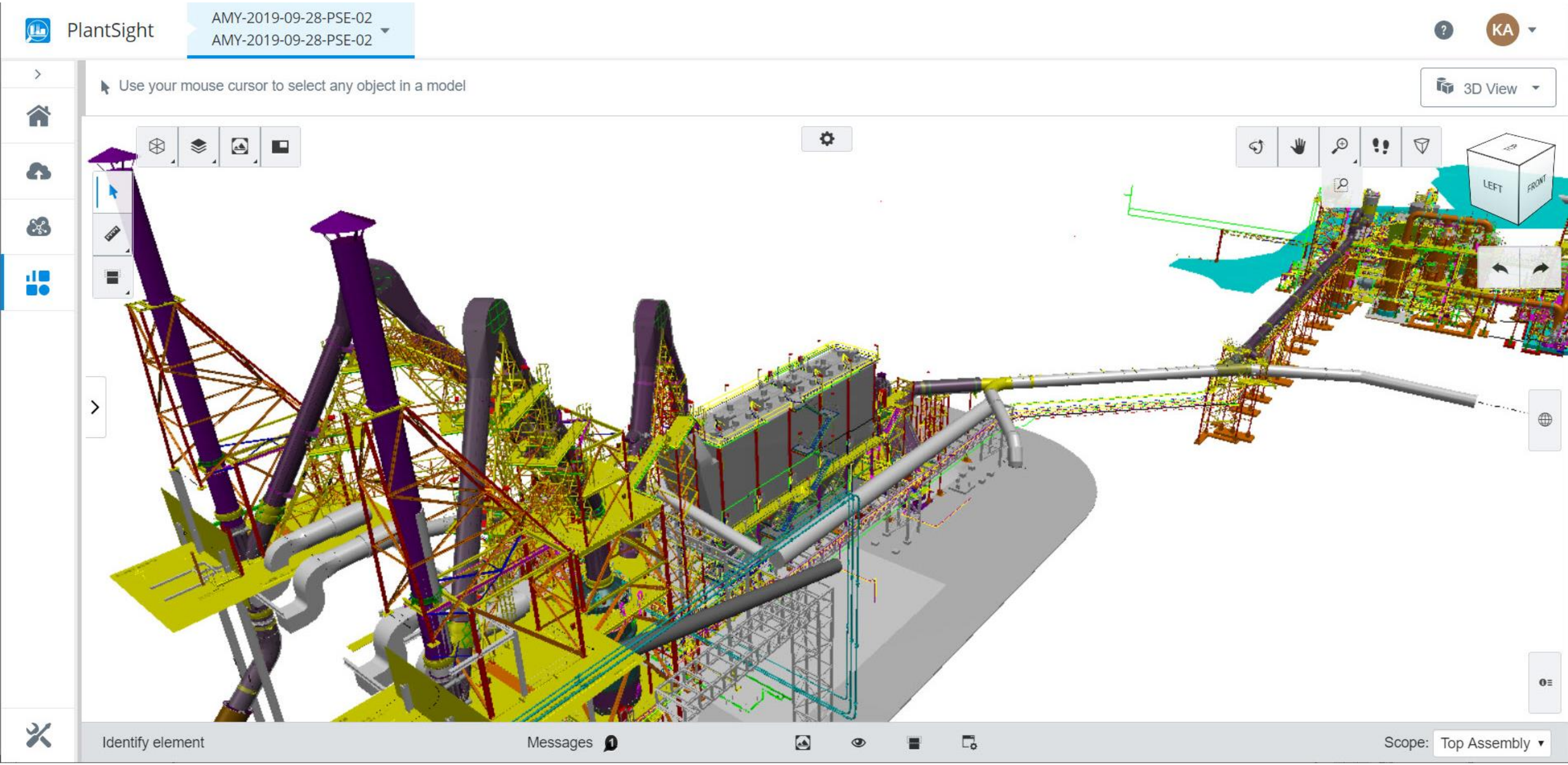

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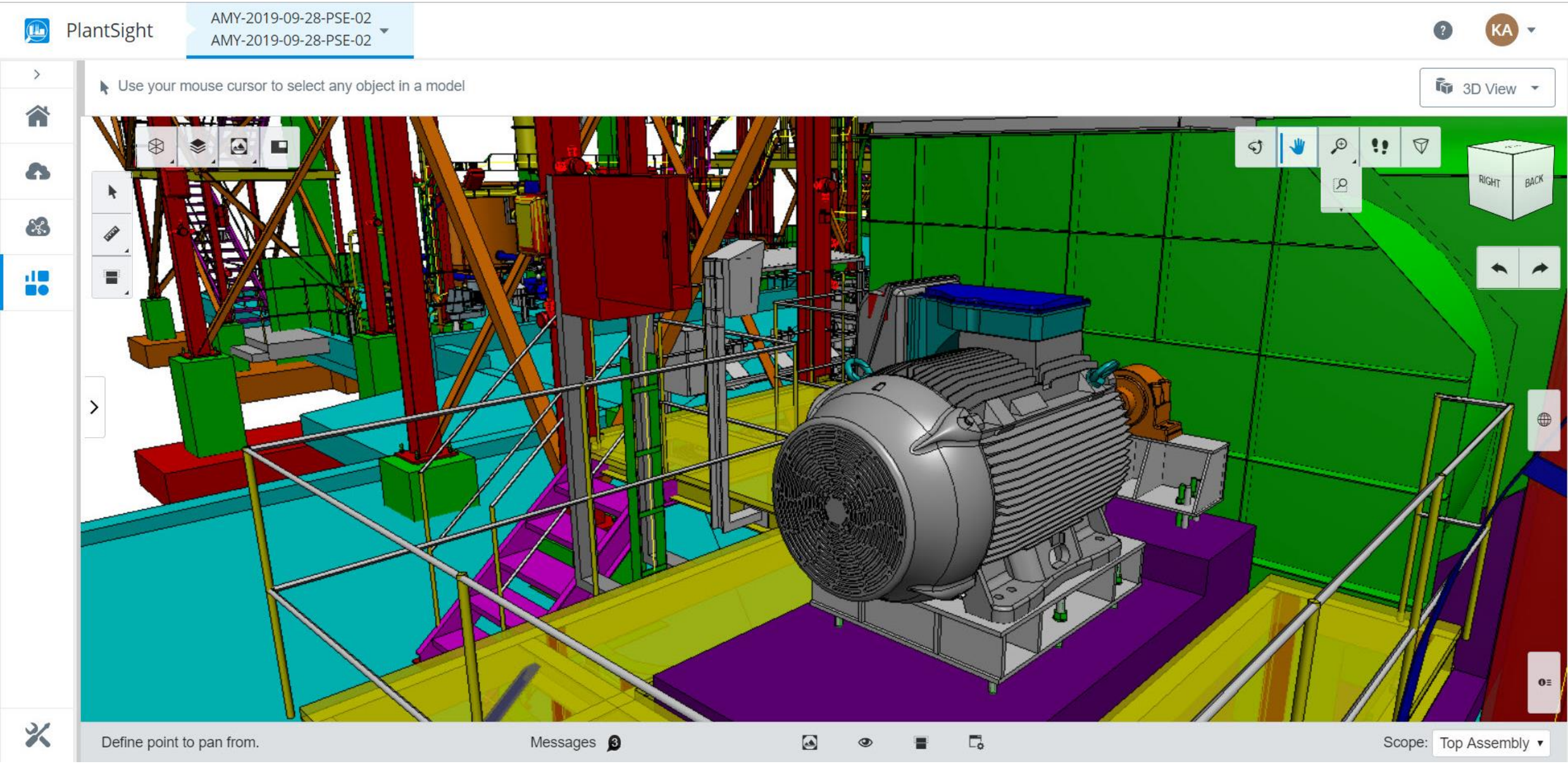

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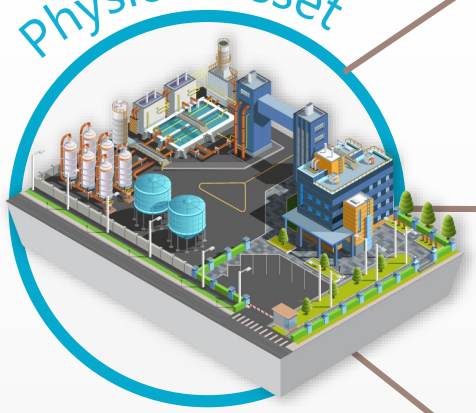


Engineering

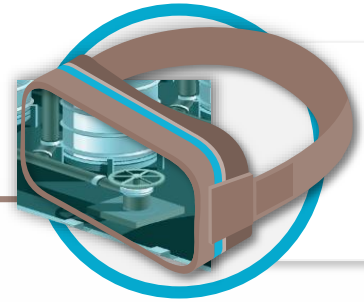
- Specs
- Drawings
- Documents
- Models
- Analyses
- Geotech
- OEM specs

Operations

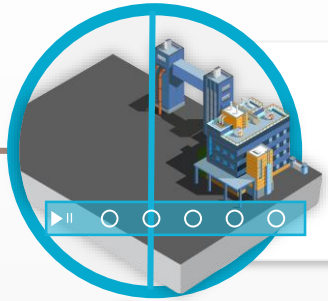
- IoT feeds
- Sensors
- Drones
- Cameras
- LiDAR
- Point clouds

Information

- Asset tags
- Work orders
- Maintenance records
- Inspection records



3D/XR
Immersive Visualization



4D
Timeline of Change

AI/ML
Analytics Visibility

iTwins are continuously updated with data from the physical asset.
This data is used to understand and model the asset's performance.

Bentley®

Bentley®

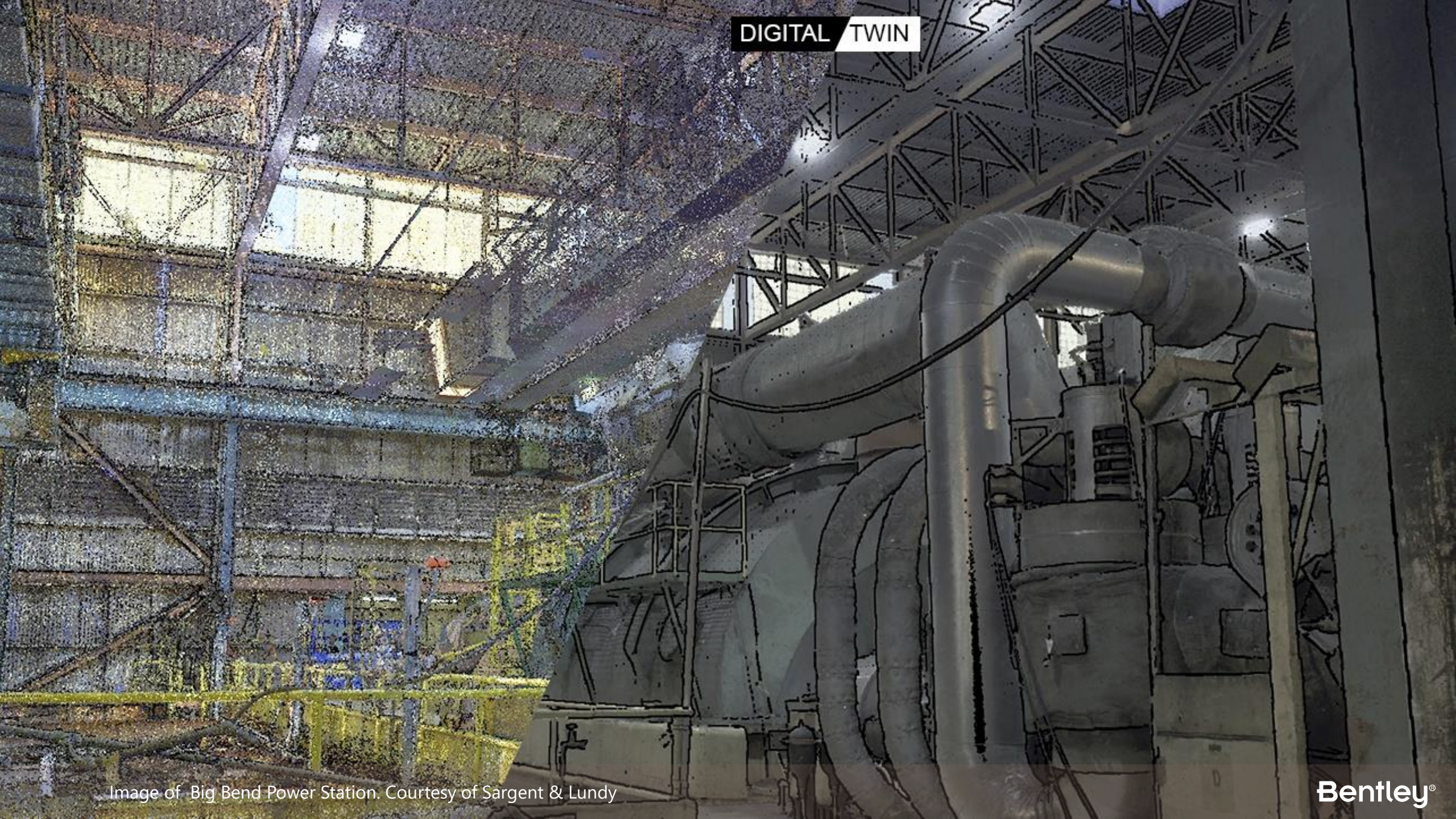


Image of Big Bend Power Station. Courtesy of Sargent & Lundy

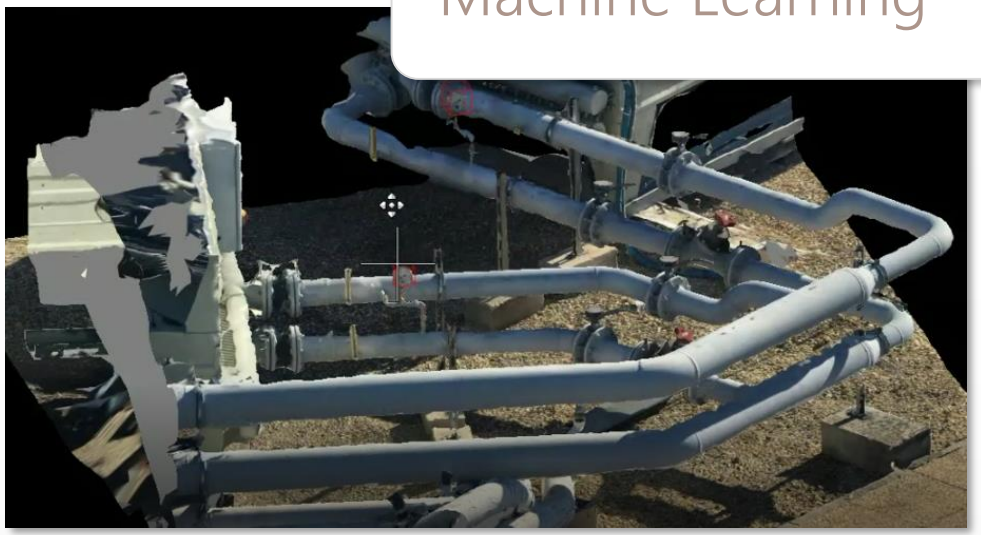
Bentley®

PlantSight

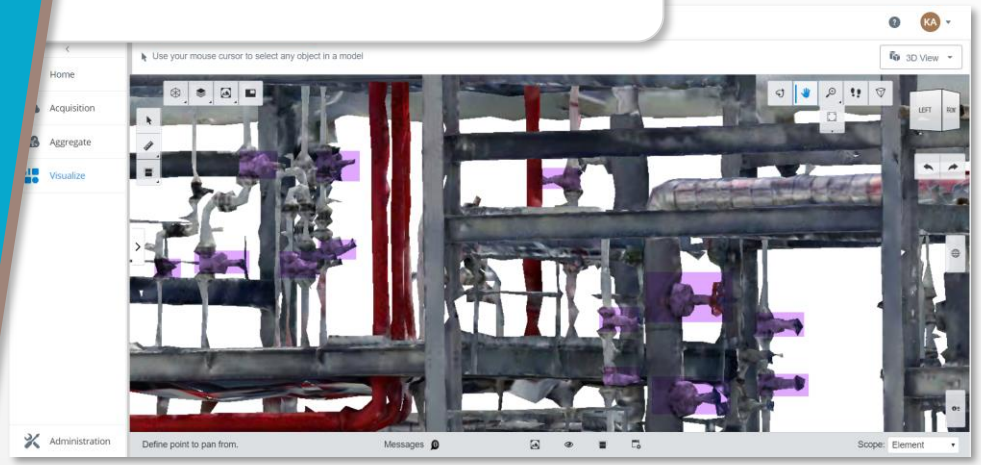
ContextCapture

Photo Capture

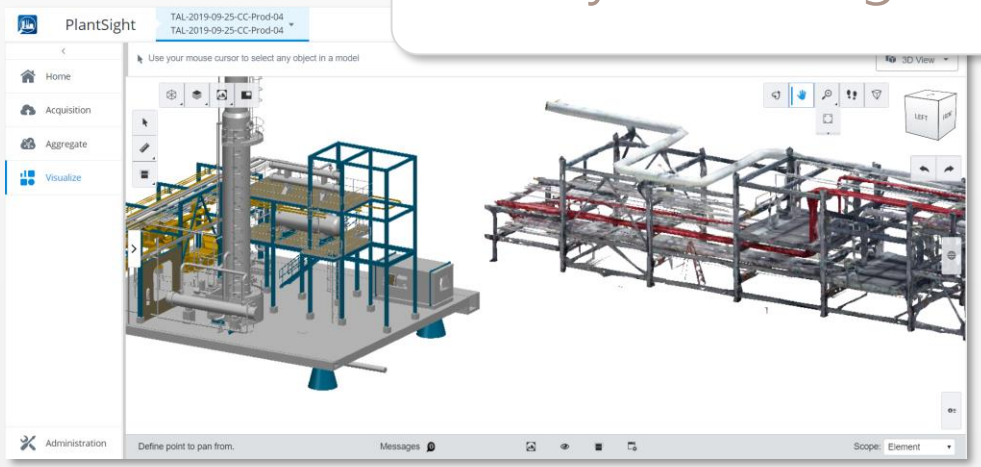
Machine Learning



Object Classification



Reality Modeling



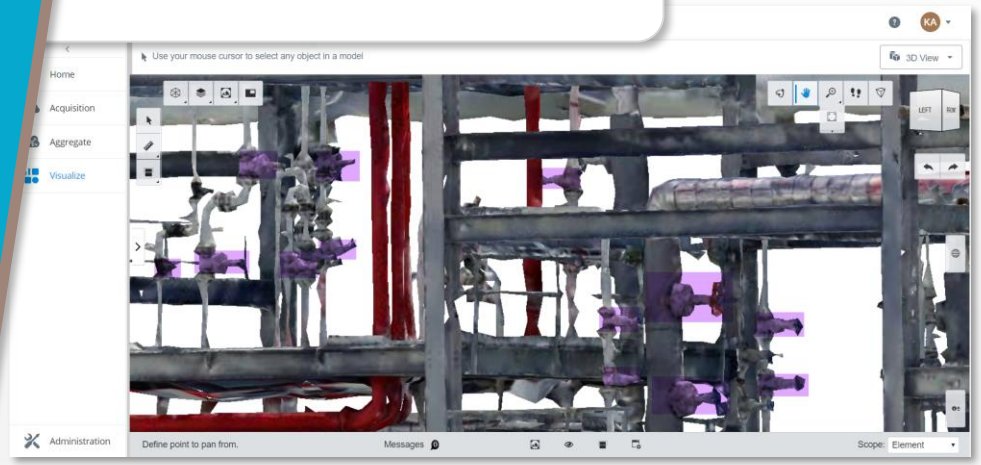
PlantSight

ContextCapture

Photo Capture

Machine Learning

Object Classification



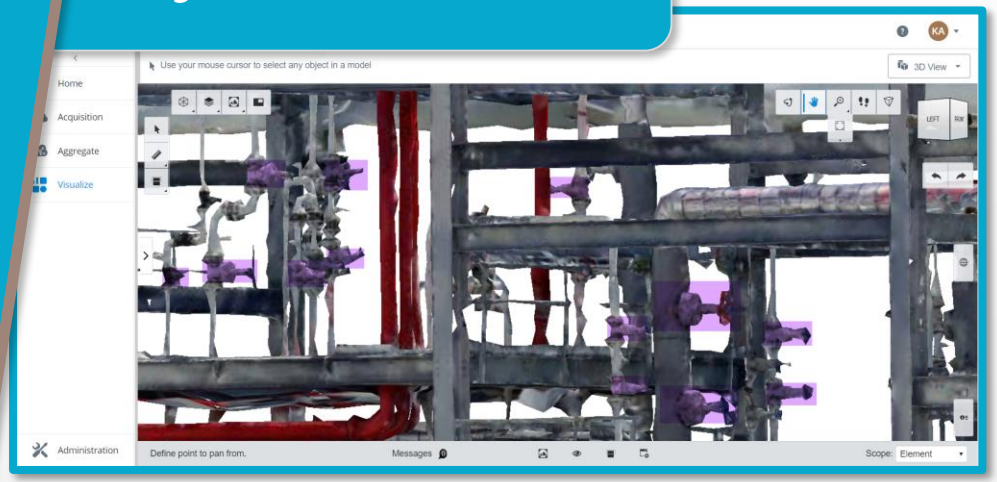
Reality Modeling

PlantSight

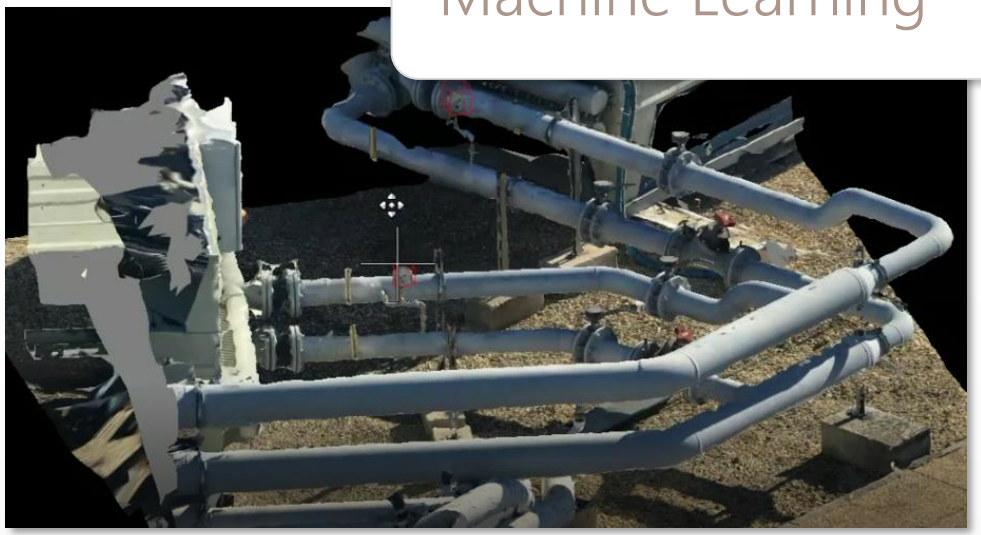
ContextCapture

Photo Capture

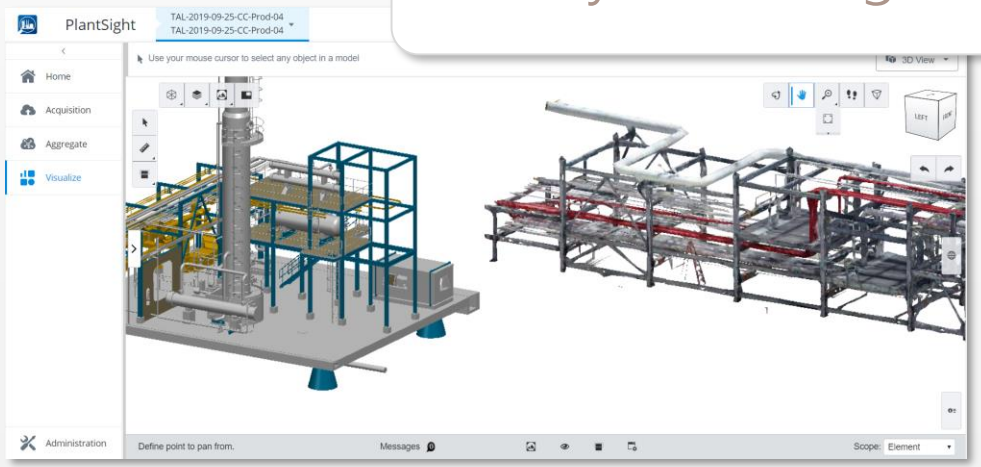
Object Classification



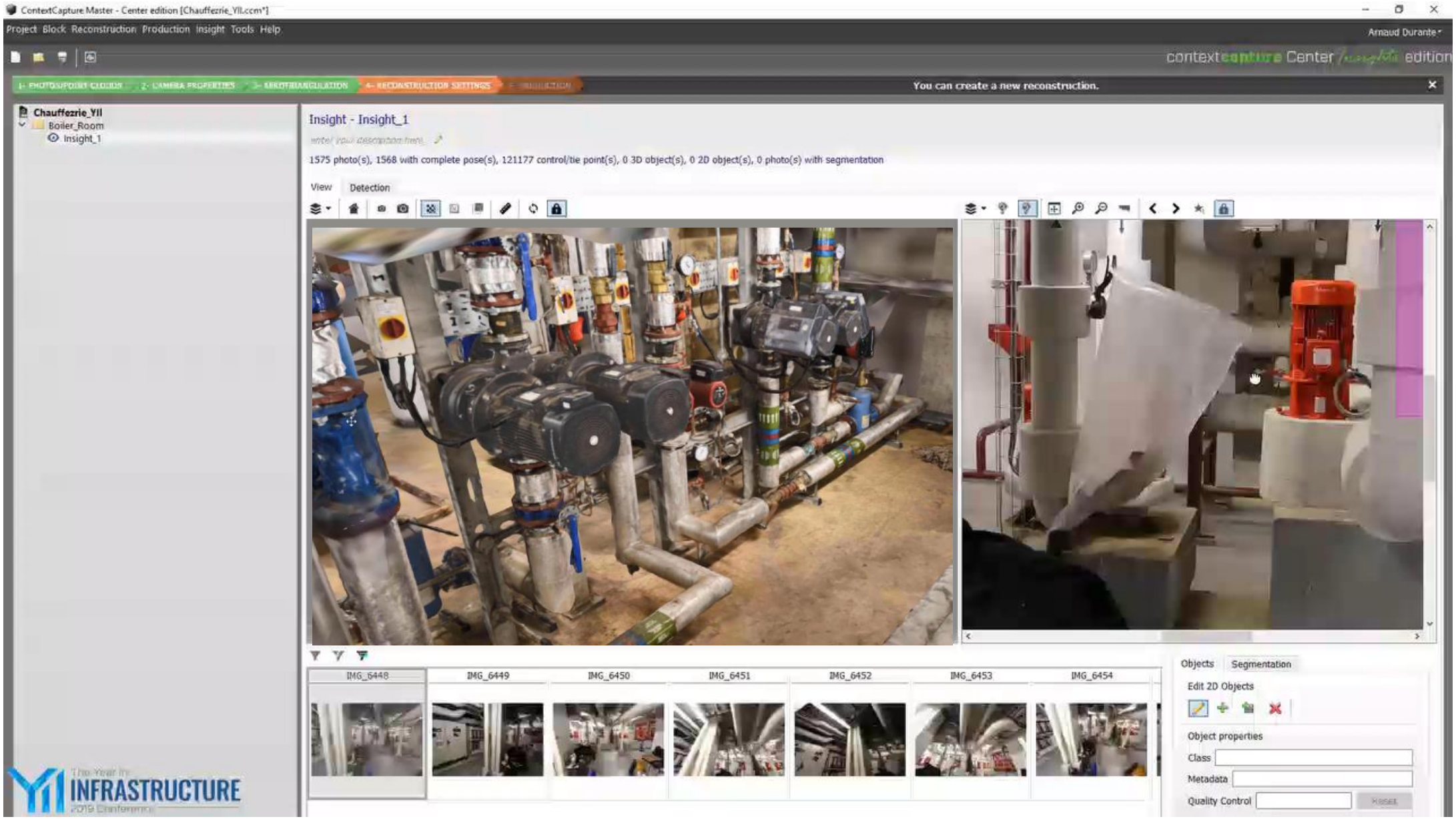
Machine Learning



Reality Modeling



Digital Components *Machine Learning*



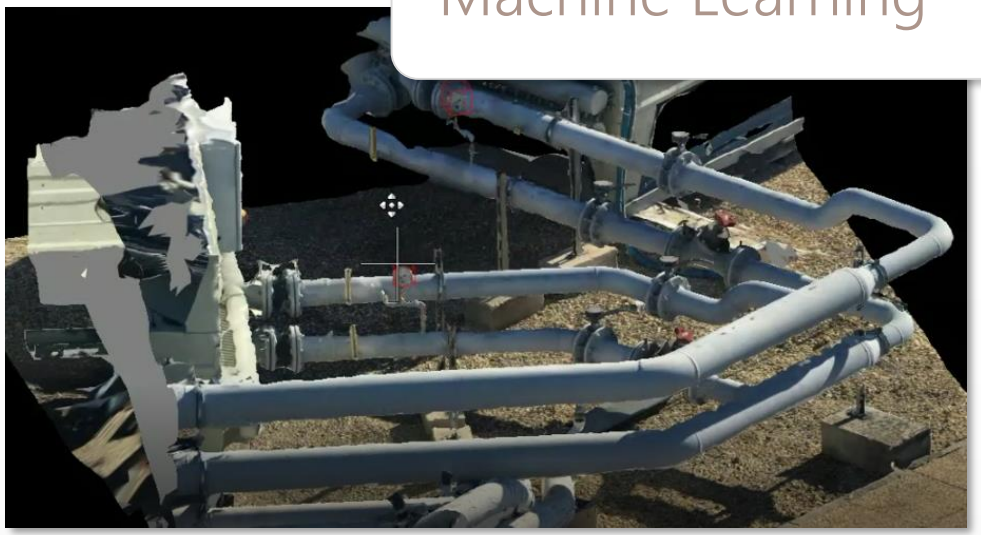
Many items

PlantSight

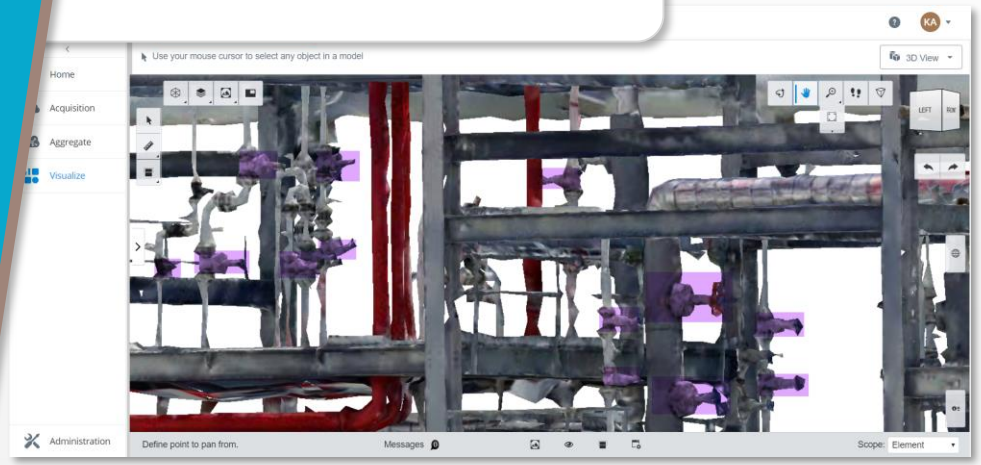
ContextCapture

Photo Capture

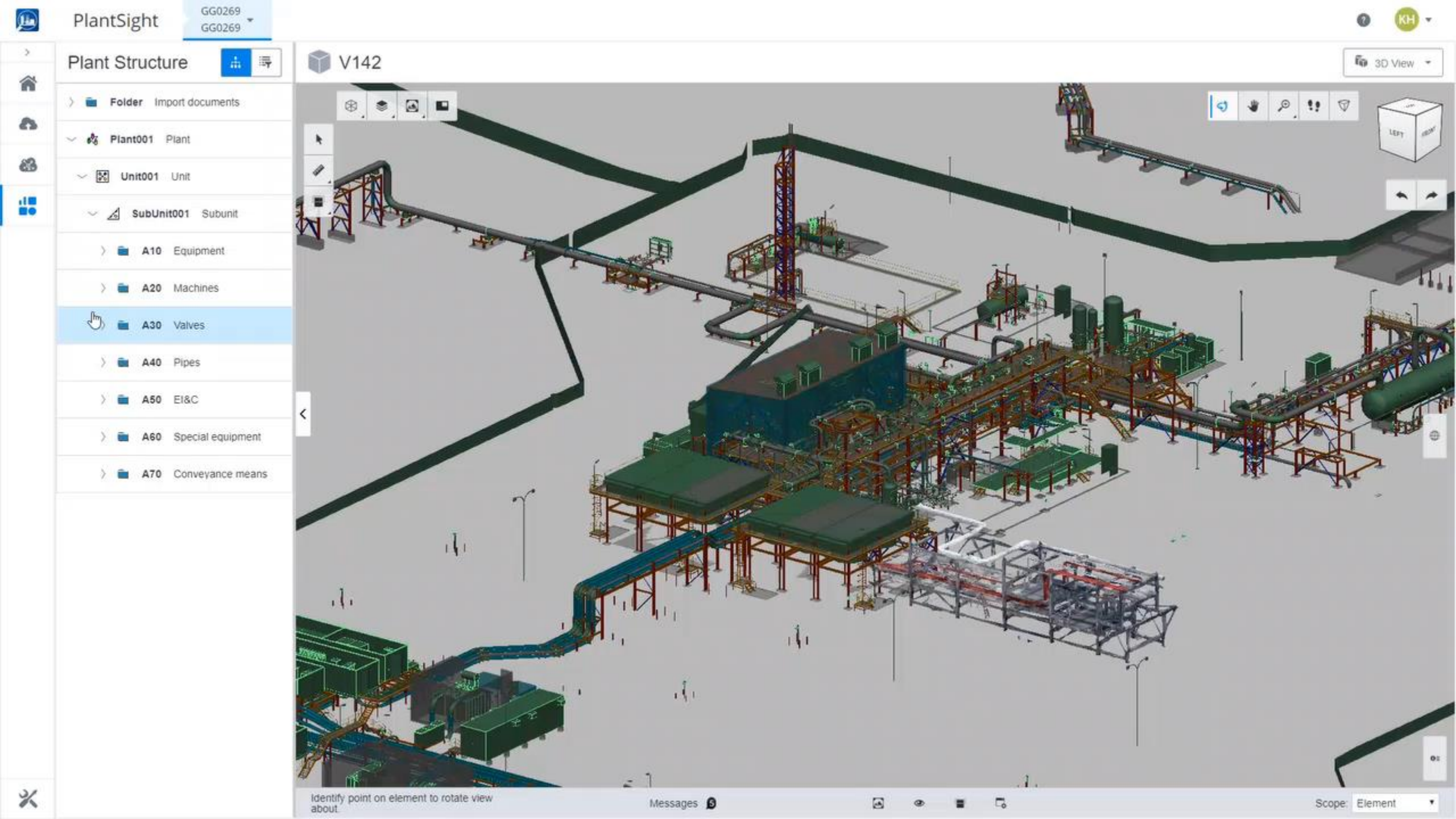
Machine Learning



Object Classification



Reality Modeling


PlantSight
GG0269
GG0269
KH
Plant Structure
V142
3D View
Folder Import documents
Plant001 Plant
Unit001 Unit
SubUnit001 Subunit
A10 Equipment
A20 Machines
A30 Valves
A40 Pipes
A50 EI&C
A60 Special equipment
A70 Conveyance means
Identify point on element to rotate view about
Messages
Scope: Element

PlantSight

Bentley Oil Processing Facility
BC07

Project

KA

Home

Digital Twin

PlantSight ☆

Singapore

Quick Links

- Create change requests
- Create distribution lists
- Distribution orders
- Documents
- Create location
- Physical items

Alarms

Air Inlet Temp (deg c) 2019-10-16T19:28:17	Acknowledge	View
Bearing Temperature 2019-10-16T19:22:16	Acknowledge	View
Cavitation 2019-10-16T19:23:58	Acknowledge	View
Condition of Bearing Cooling Water 2019-10-16T19:29:25	Acknowledge	View
Condition of Guide Rail Wear Strips 2019-10-16T19:30:50	Acknowledge	View

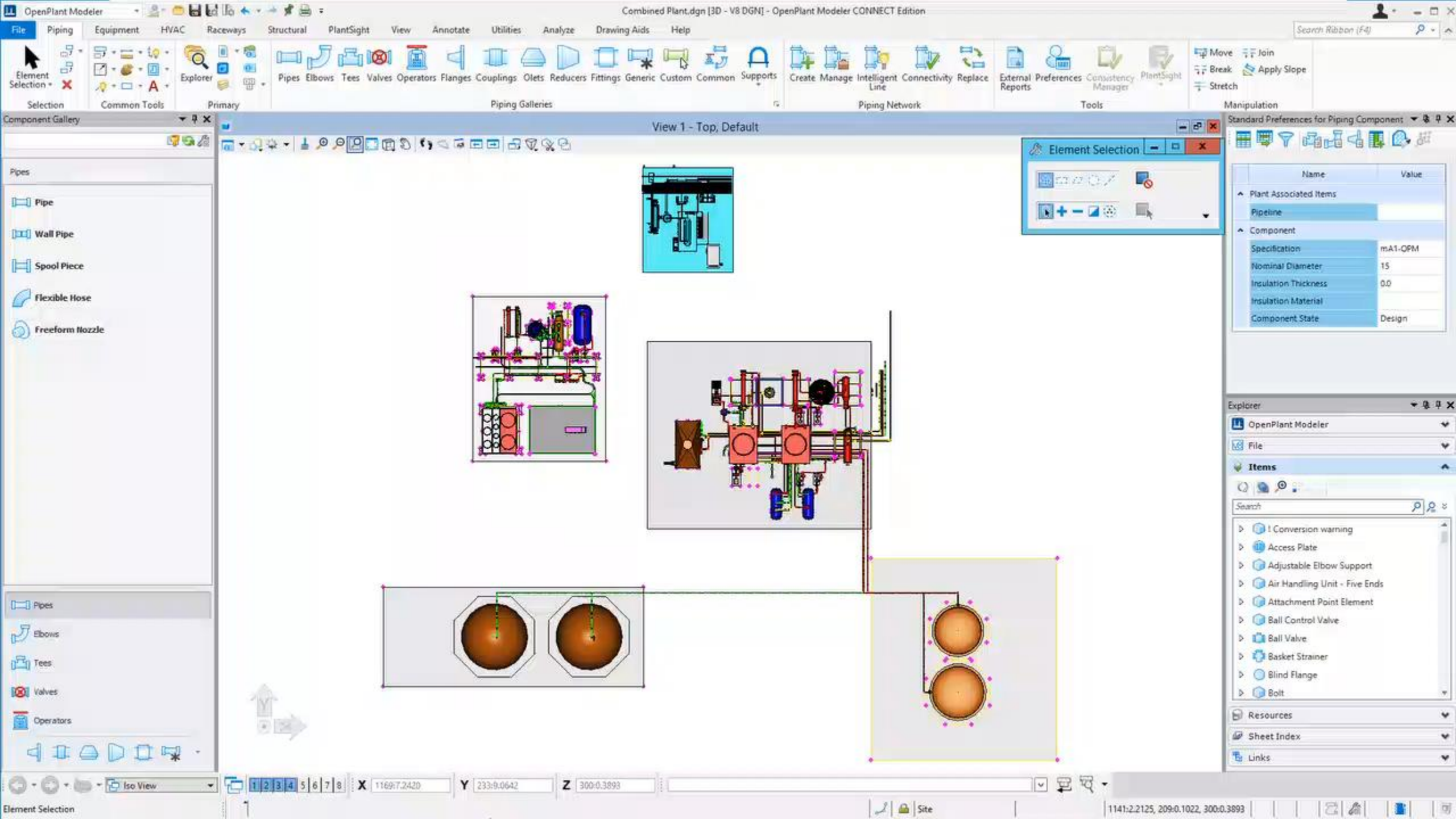
My tasks

- john assigned an inspection to you
  Inspect water pipe
  NEW — Due in 14 days
- Approve this event
  EVT-0001 - Event
  August 8, 2019 — 1 day Overdue
- Distribution order: Approval task
  DO-0001
  August 12, 2019 — Due in 2 days
- Please approve
  WO-0011 Work Order
  August 12, 2019 — Due in 3 days
- Tag approval
  Tag-0001 (1) - Tag
  August 25, 2019 — September 6, 2019

View All

Recent activity

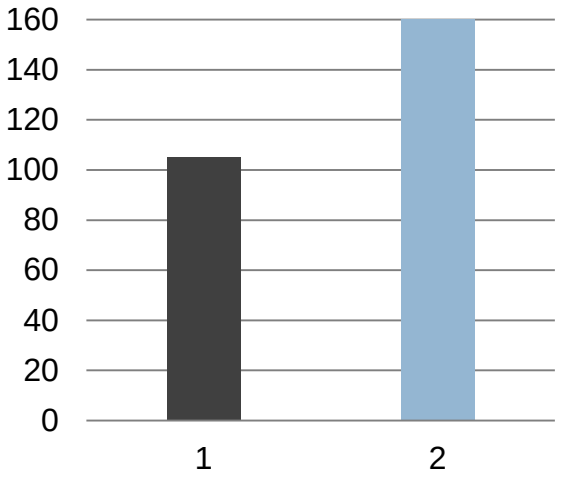
- Approve for all subsequent steps
  WO-0004 Work Order
  13 seconds ago — Created
- Approve this document
  DGN-265516-CDOP-48487
  58 minutes ago — Created
- Approve physical item
  PHYS-0001 - Physical item
  August 9, 2019 — Edited
- Approve this
  WO-0008 Work Order
  August 12, 2019 — Created
- Approve this change request
  CHG-REQ-0001 - Change Request
  August 25, 2019 — Viewed


OpenPlant Modeler
Combined Plant.dgn [3D - V8 DGN] - OpenPlant Modeler CONNECT Edition
File
Piping
Equipment
HVAC
Raceways
Structural
PlantSight
View
Annotate
Utilities
Analyze
Drawing Aids
Help
Search Ribbon (F4)
Element Selection
Selection
Common Tools
Explorer
Primary
Pipes
Elbows
Tees
Valves
Operators
Flanges
Couplings
Olets
Reducers
Fittings
Generic
Custom
Common
Supports
Piping Galleries
Create
Manage
Intelligent Line
Connectivity
Replace
Piping Network
External Reports
Preferences
Consistency Manager
PlantSight
Tools
Move
Join
Break
Apply Slope
Stretch
Manipulation
Component Gallery
Pipes
Pipe
Wall Pipe
Spool Piece
Flexible Hose
Freeform Nozzle
Elbows
Tees
Valves
Operators
View 1 - Top, Default
Element Selection
Standard Preferences for Piping Component
Name
Value
Plant Associated Items
Pipeline
Component
Specification
mA1-OPM
Nominal Diameter
15
Insulation Thickness
0.0
Insulation Material
Component State
Design
Explorer
OpenPlant Modeler
File
Items
Search
! Conversion warning
Access Plate
Adjustable Elbow Support
Air Handling Unit - Five Ends
Attachment Point Element
Ball Control Valve
Ball Valve
Basket Strainer
Blind Flange
Bolt
Resources
Sheet Index
Links
Iso View
X
Y
Z
Element Selection
Site

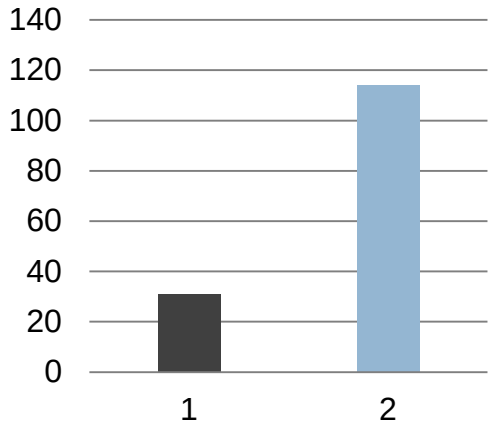
Advancing BIM and GIS *through (4D!) Digital Twins…*

Digital Advancements credited by YII Award Nominees

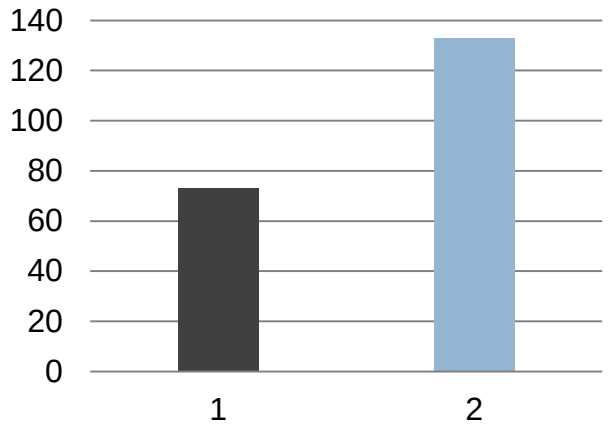
Reality Modeling



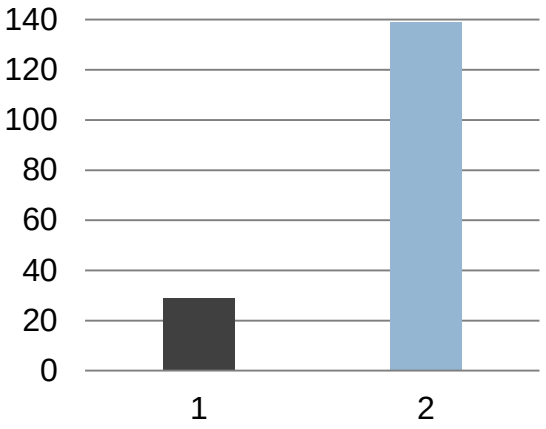
Connected Data Environment



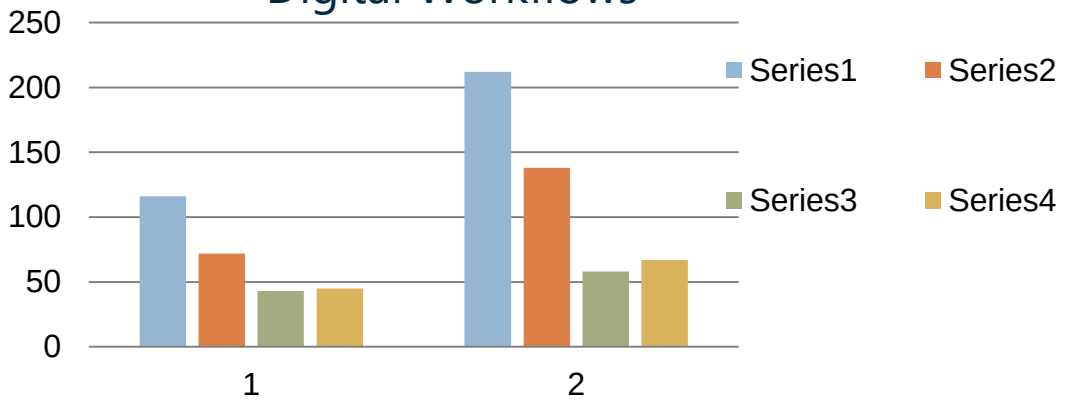
iModels



Digital Twins



Digital Workflows



571 NOMINATED **PROJECTS**

representing **project locations** in

60+ **COUNTRIES**

and

400+ **CITIES**

Digital Twins

Image Courtesy of Sweco

Image Courtesy of Hatch

Image Courtesy of Gothenburg City

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