Optimizing Point Cloud Data for the 3D Digitalization of the Physical World

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Elysium Inc.

Agenda

- **Presenter background**
- **Company overview**
- **Point cloud use cases and issues today**
- **InfiPoints solution overview**
- **Demos**
- **Customer case studies**
- **Q&A**

Presenter Background

Danielle (Williams) Perelli
Customer Engagement Specialist - Elysium Inc.

- Manage customer engagements to address Data Migration, Multi-CAD Interoperability/Collaboration, Data Quality Management, Data Optimization, and Validation
- Collaborate with technical team members, development, and Elysium offices globally on product enhancement, global marketing, and to support customer engagements

Nate Soulje
Application Support Specialist - Elysium Inc.

- Collaborates with sales and development to support both current and future customers with Elysium solutions
- Focused on industry knowledge in topics such as MBD/MBE, LOTAR, Validation, etc.
- B.S. in Nuclear Engineering
- M.S. in Mechanical Engineering

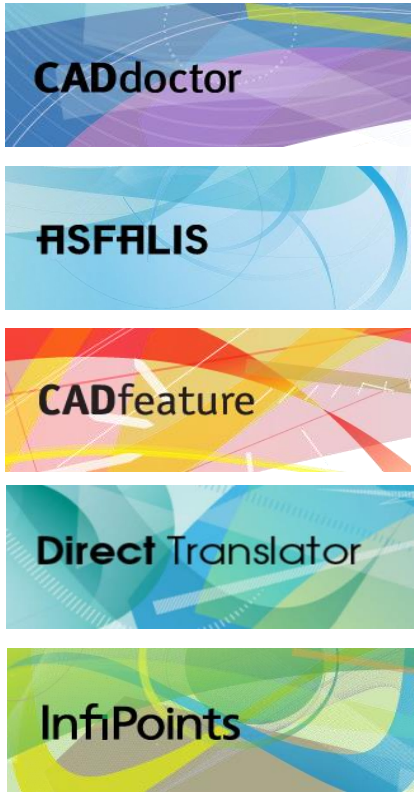
Elysium Company Intro

- Over 30 years of CAD expertise
- Strong partnerships with CAD vendors
- 3D Data Expertise:
  - Translation
  - Geometry Healing
  - Quality Management
  - Validation
  - Simplification
  - Reverse Engineering / Point Cloud Rendering
- Off-the-Shelf, OEM, & Migration Services

aras corp · AUTODESK. · DASSAULT SYSTEMES · PTC · SIEMENS

Elysium Solutions

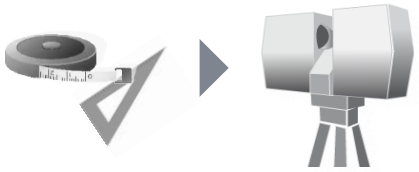
- 3D Data Translation
  - Geometry, product structure, PMI/FTA, attributes, features, constrains, etc.
- 3D Data Applications
  - Optimization, validation, quality checking and healing, polygon operation, point cloud handling, reverse engineering



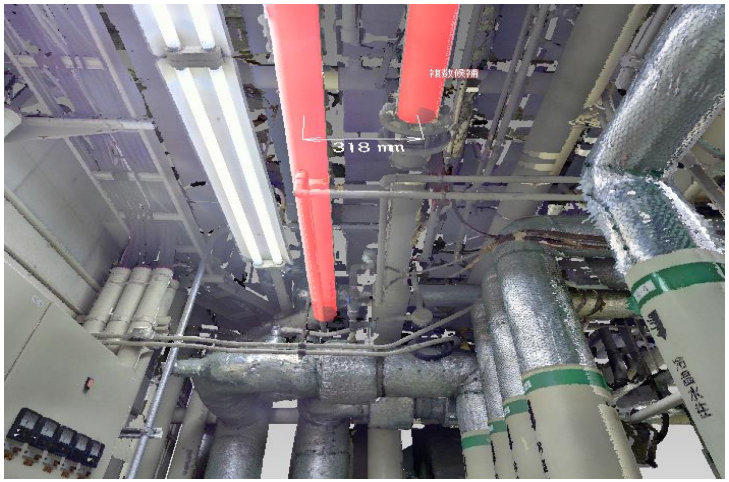
Use Cases of Point Cloud Data

Digital Measurements

Easily measure dimensions of your equipment and facilities without the haste of facing danger of hand measuring



Measurement at the ceiling



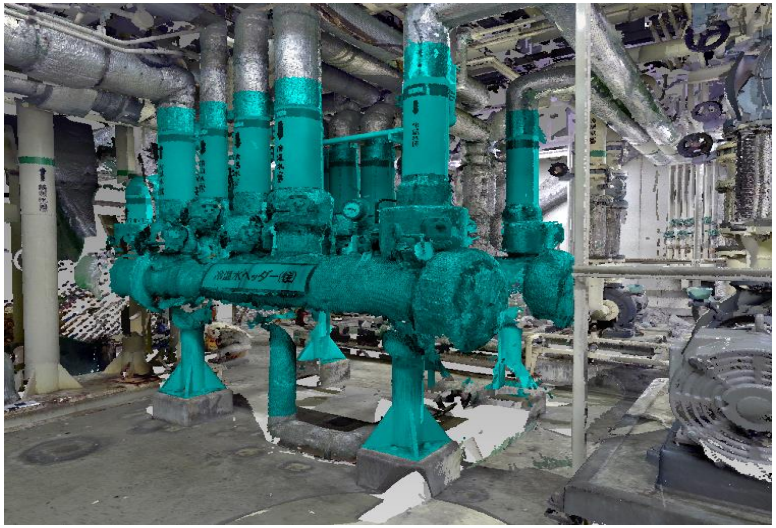
Measurement at large equipment or at heights

Capture As-Built

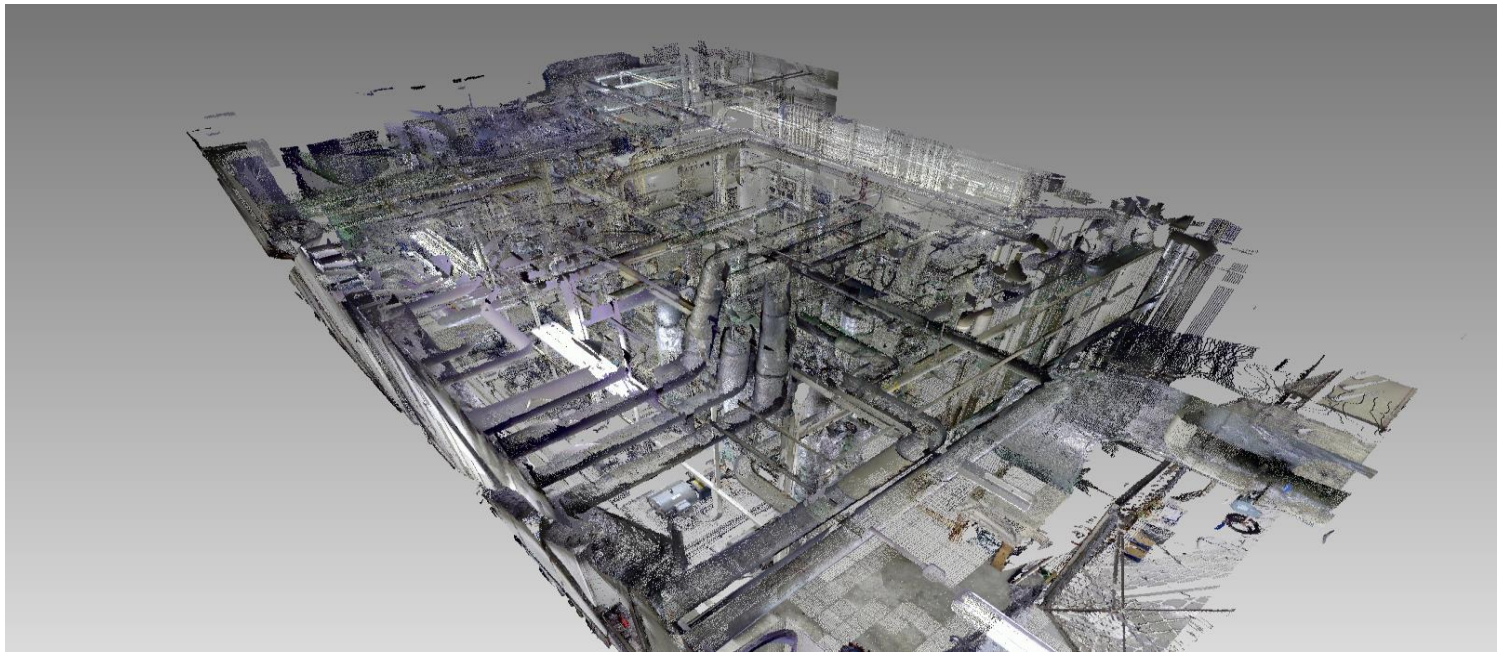
Digitally capture as-built products, systems, facilities, etc.

Layout Planning Removal/Movement Simulation

Clip out an equipment to examine before/after of construction



Automatically extract planes/cylinders from point cloud to easily perform CAD modeling



Issues Using Point Cloud Data Today

- Specific points need to be determined to perform **measurements** which can be inaccurate and take time
- Manually cleaning up **noise** within the data is extremely time consuming
- Point cloud data can be very **large and difficult** to work with
- A lot of **manual work** can be required when modeling features like pipes and equipment
- It can take **multiple software packages** to prepare the data for downstream uses
- **Limited formats** to work with, such as CAD formats
- **Collaboration** can be difficult

The Solution

InfiPoints

What is InfiPoints?

- **A large scale point cloud handling tool developed by Elysium**
- **Used in various industries/fields**

Shipbuilding

Plant

Manufacturing

Construction

Architecture

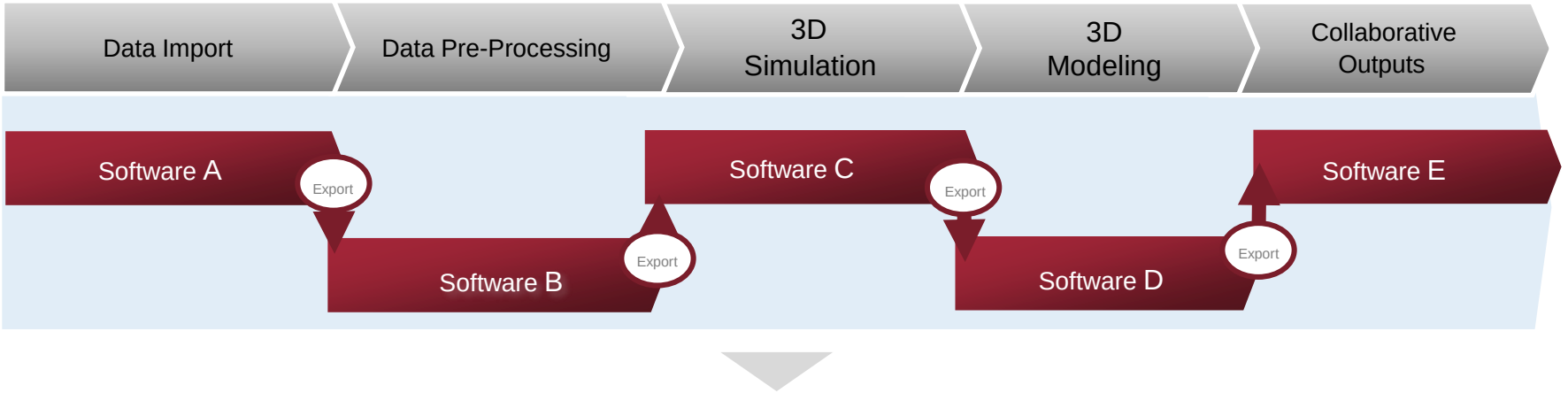
Aerospace

Automotive

InfiPoints Concept

Comprehensive Software to Facilitate the Entire Process of Point Cloud Utilization

Point Cloud Utilization Flow



InfiPoints, your One Stop Solution streamlines the process

Easier Utilization of Point Cloud Data

Reducing Time for Data Preparation

- Dramatically reduce time and labor to prepare data for utilization by easily registering multiple scans from a laser scanner and performing powerful noise reduction

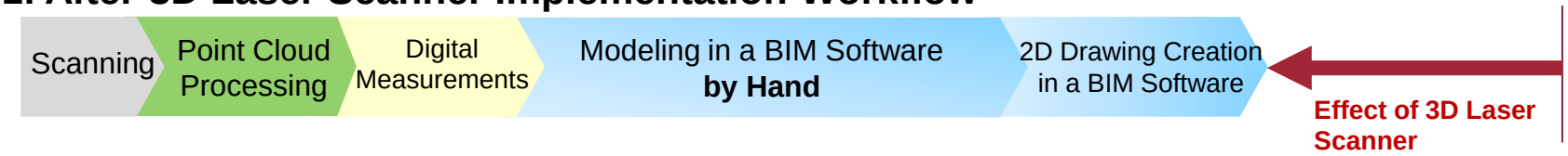
Smoothly Work in a Large Scale Environment

- Billions of points will not stop you from smoothly handling your point clouds
- Dramatically reduce time and labor of modeling by using plane/cylinder automatic extraction and tools

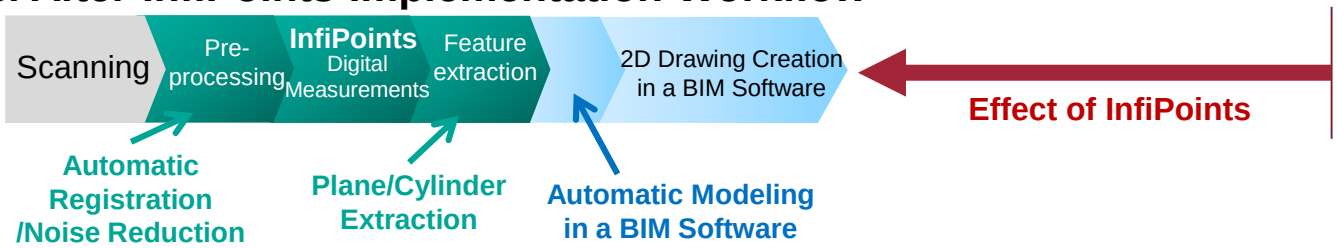
Data Preparation Time Reduction Scenario

1. Conventional Workflow

2. After 3D Laser Scanner Implementation Workflow



3. After InfiPoints Implementation Workflow



50% Reduction in time!

Functions – 5 Processes

InfiPoints supports your one-stop point cloud utilization in the following 5 processes

Data Import

Data Pre-processing

Analysis

Modeling

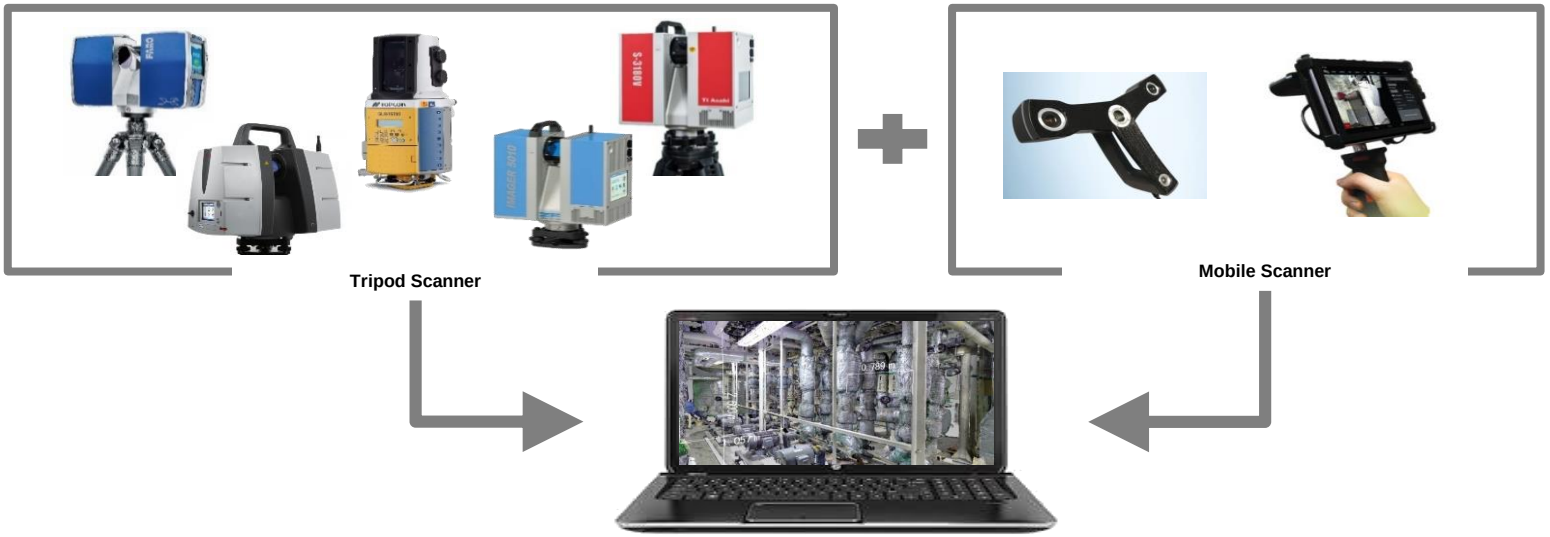
Collaborative Outputs

Data Import

- **Import multiple scan data formats including native scanner data**
- **Viewing of large scale point clouds (billions)**

Register Point Clouds from Different Scanners

Register your point cloud data from data coming from both a tripod scanner and a mobile scanner



Data Pre-processing

- **Markerless Automatic Registration**
- **Automatic Noise Reduction**
- **Target Recognition, Coordinate Transformation**

In collaboration with

BC Engineering and Design

Markerless Registration

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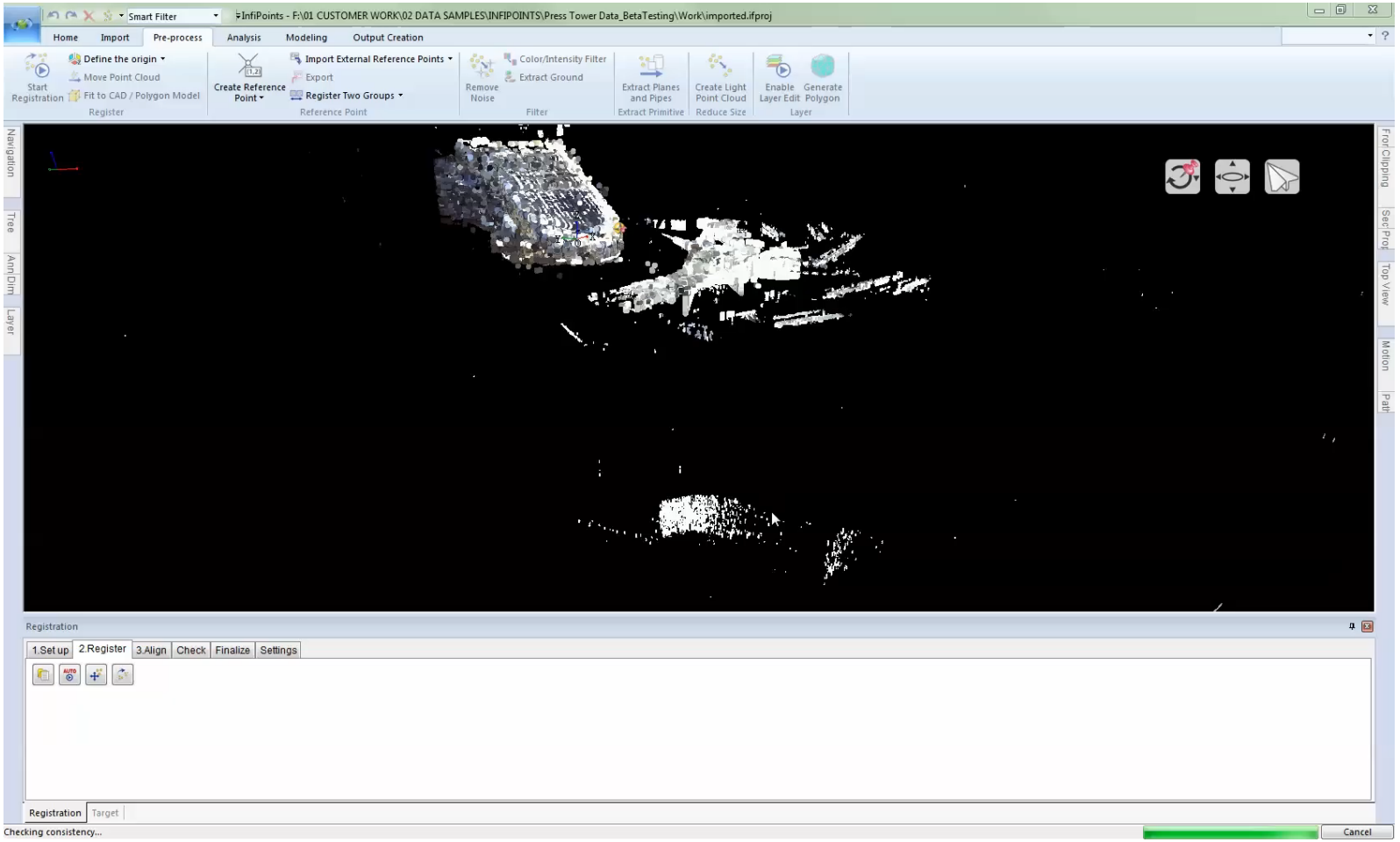
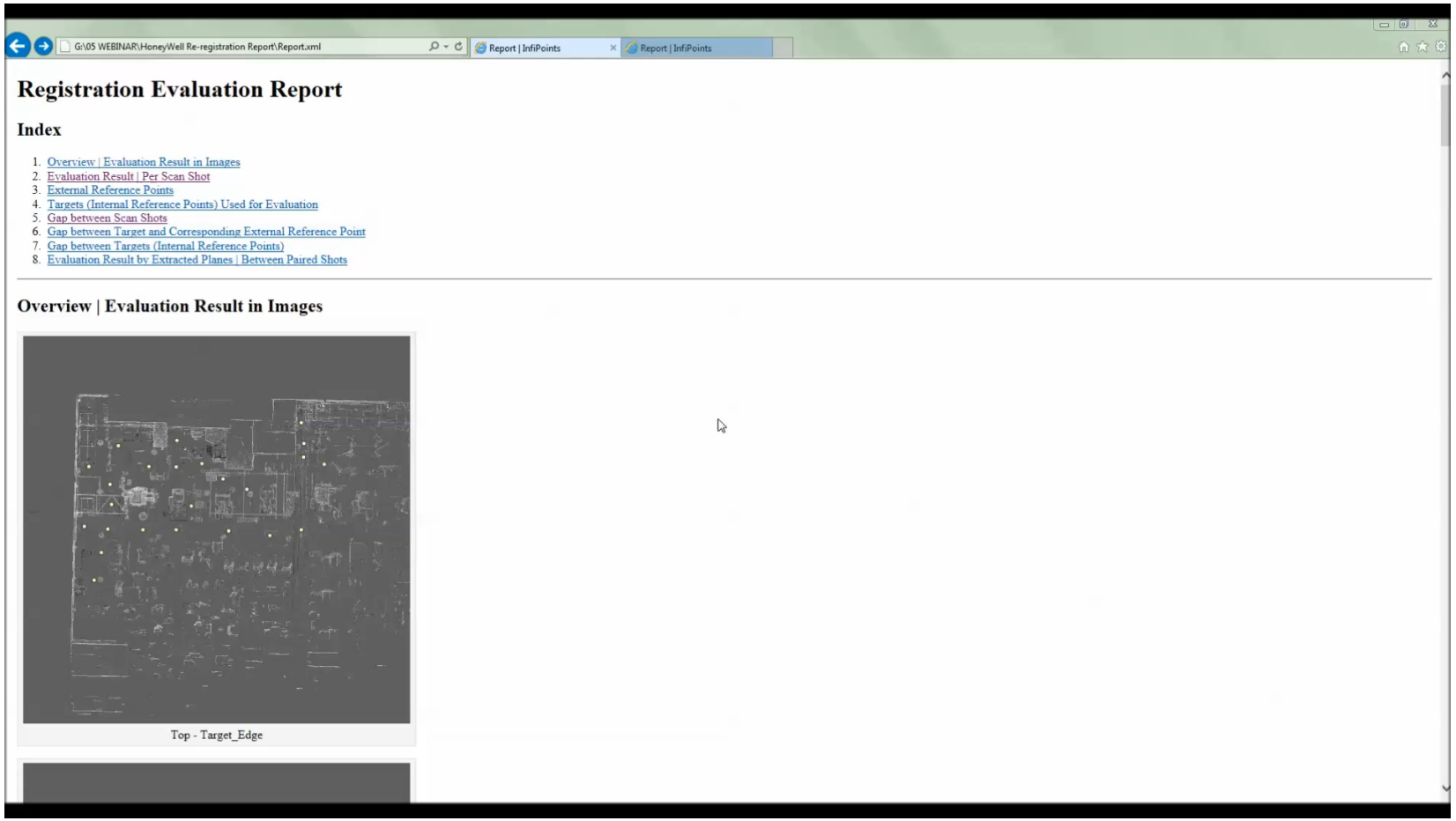


XML Report



Automatic Noise Reduction

Overlapping Noise

Automatic Noise Reduction

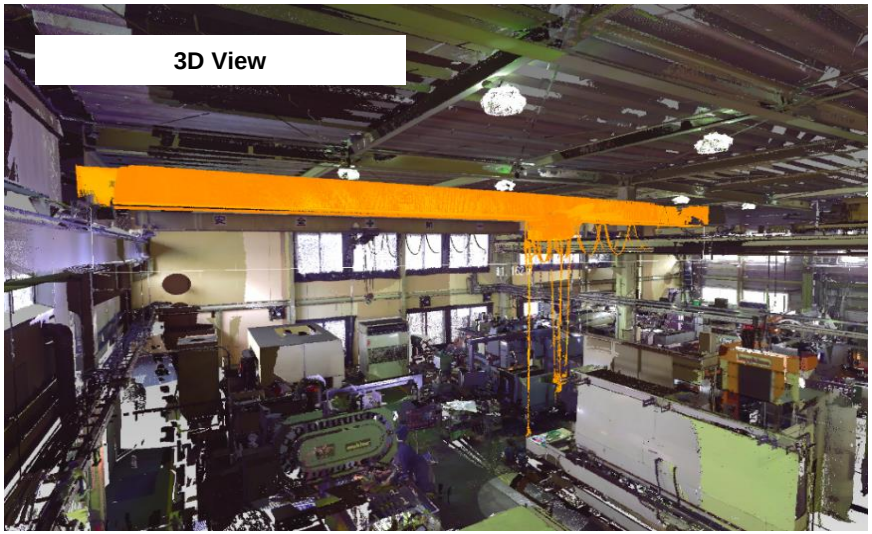
Removing Kinetic Noise

Analysis

- **Measurements using extracted planes/cylinders**
- **Real-time interference check along path and with interaction**
- **Comparison between CAD and Point Cloud**

Measurements Using Extracted Planes/Pipes

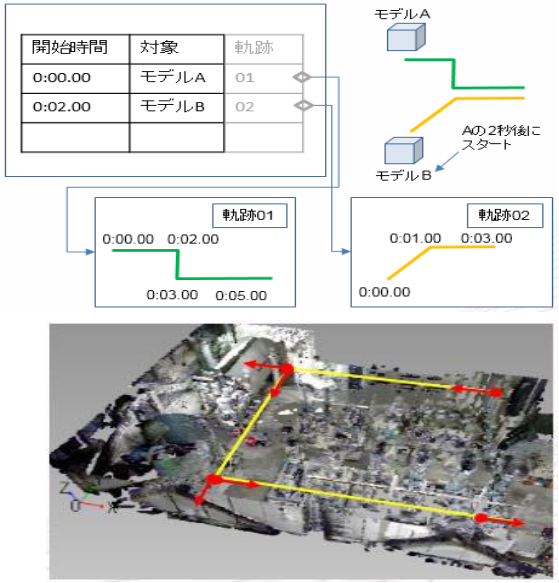
Case Study-Ceiling Crane Rail Measurements



Reduce dangerous height work using digital measurements

Real-time Interference Check Along Path

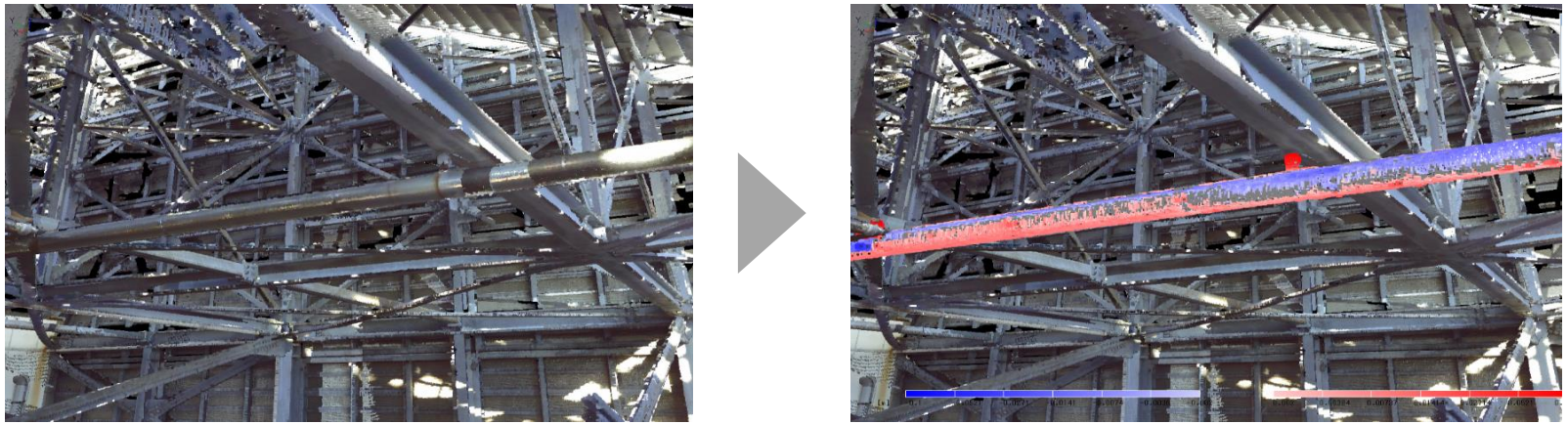
Path creation, movement of CAD model along the path and performance of real-time interference checking
Save your CAD model path movement as a movie as well



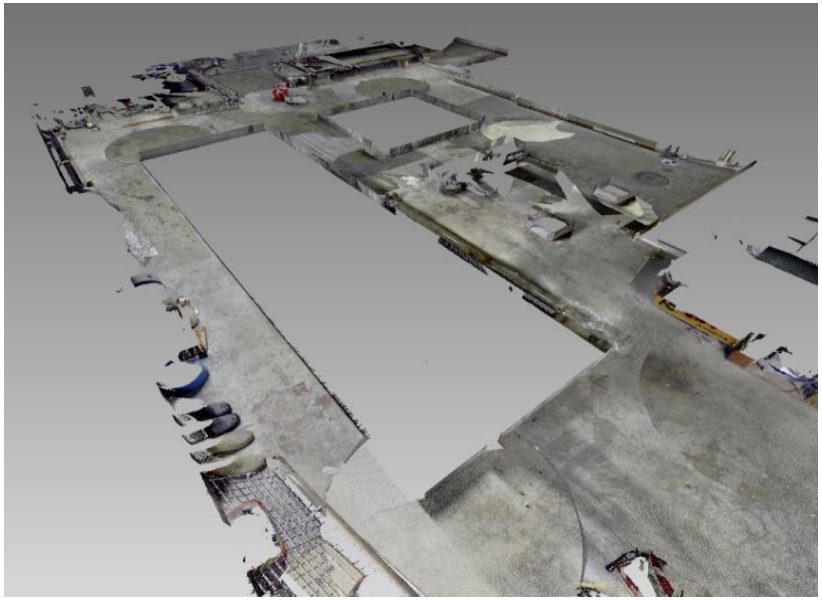
Comparison Between CAD and Point Cloud

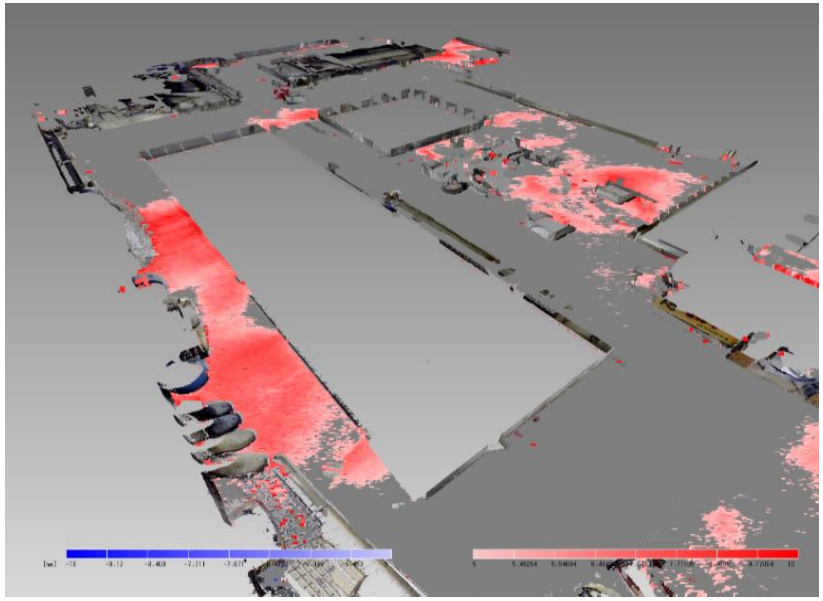
Overlay a CAD model to a scanned point cloud data and extract deviation

Examine deviation between planned and result or used for monitoring of secular changes of equipment



Case Study-Examine Inclination of Construction Plane





Prevent implementation problems of equipment by checking inclination of the construction plane

Modeling

- **Mesh Creation**
- **Pipes**
- **Equipment**
- **Steel Structures**
- **Ducts**

Layer Classification of Point Cloud for Mesh Creation

Layer Classification

Mesh Creation

Pipe Modeling

Pipe Modeling

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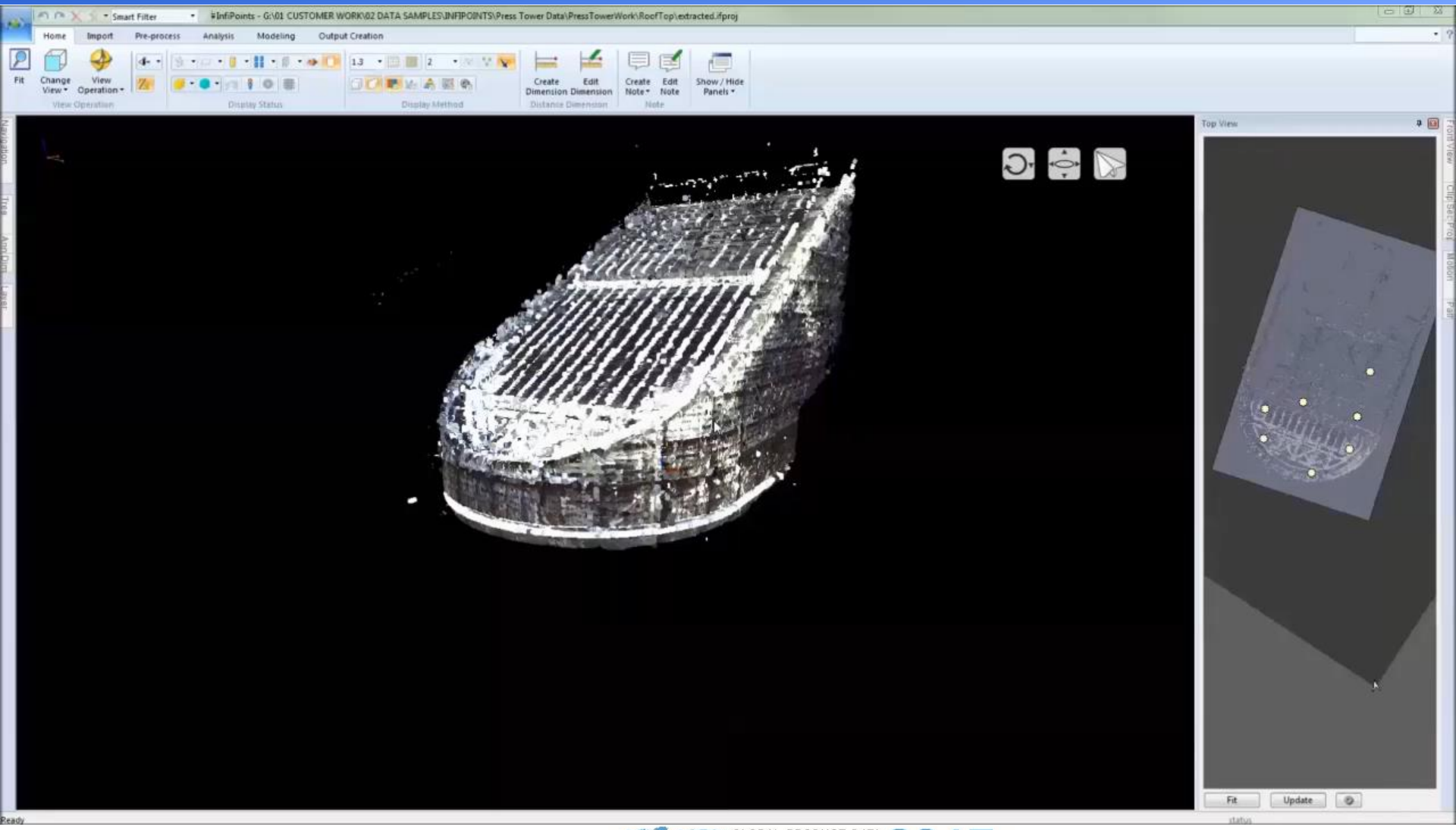
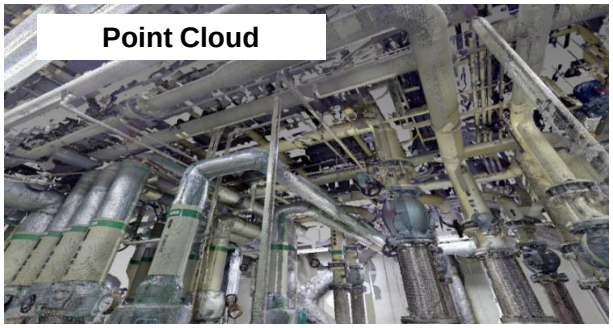
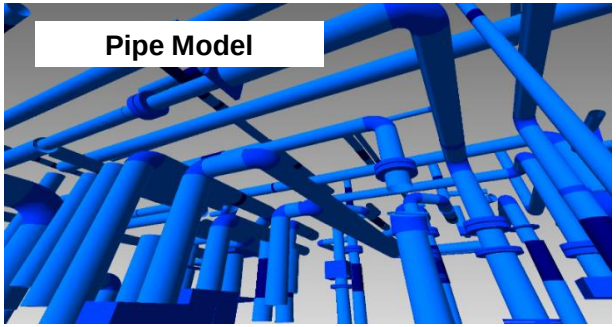
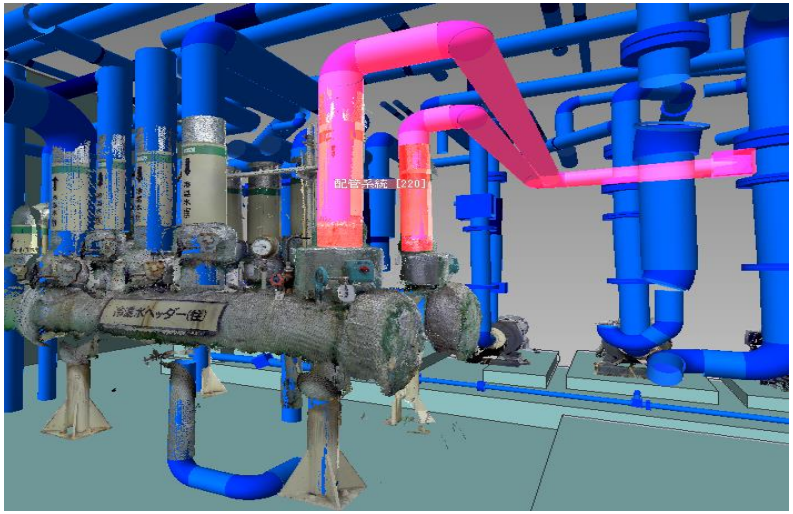


Case Study-Existing Pipe Renewal/Construction

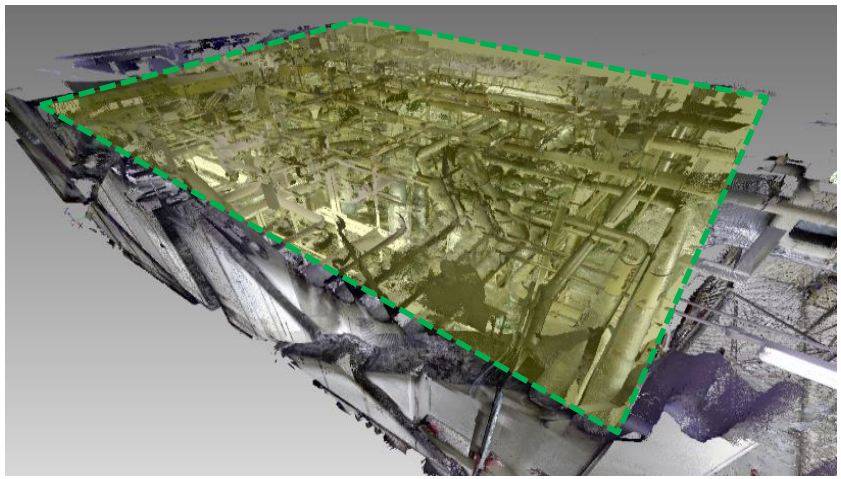


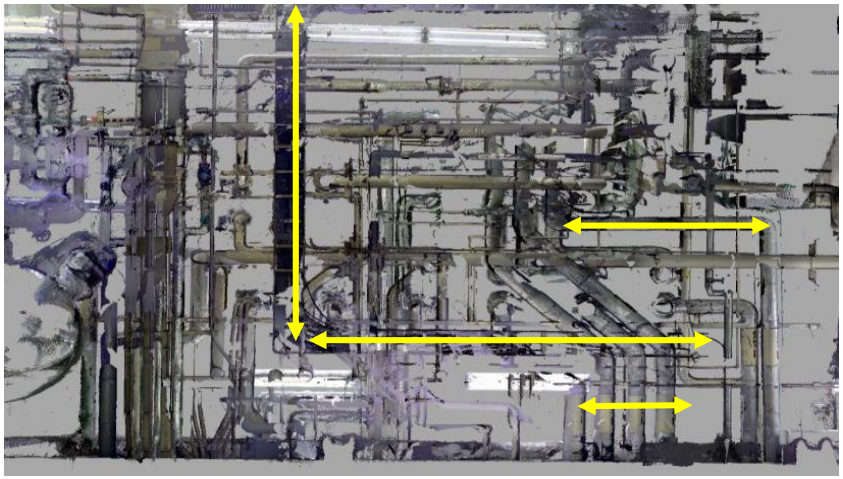




Check connection of pipes to an existing equipment and estimate new piping needed for construction

Case Study-Piping Renewal Study





Example of a section view displaying pipes near the ceiling

Cut a cross section of your desired area and measure walls and near ceiling areas
Very difficult to hand measure and not have any human errors

Equipment Modeling

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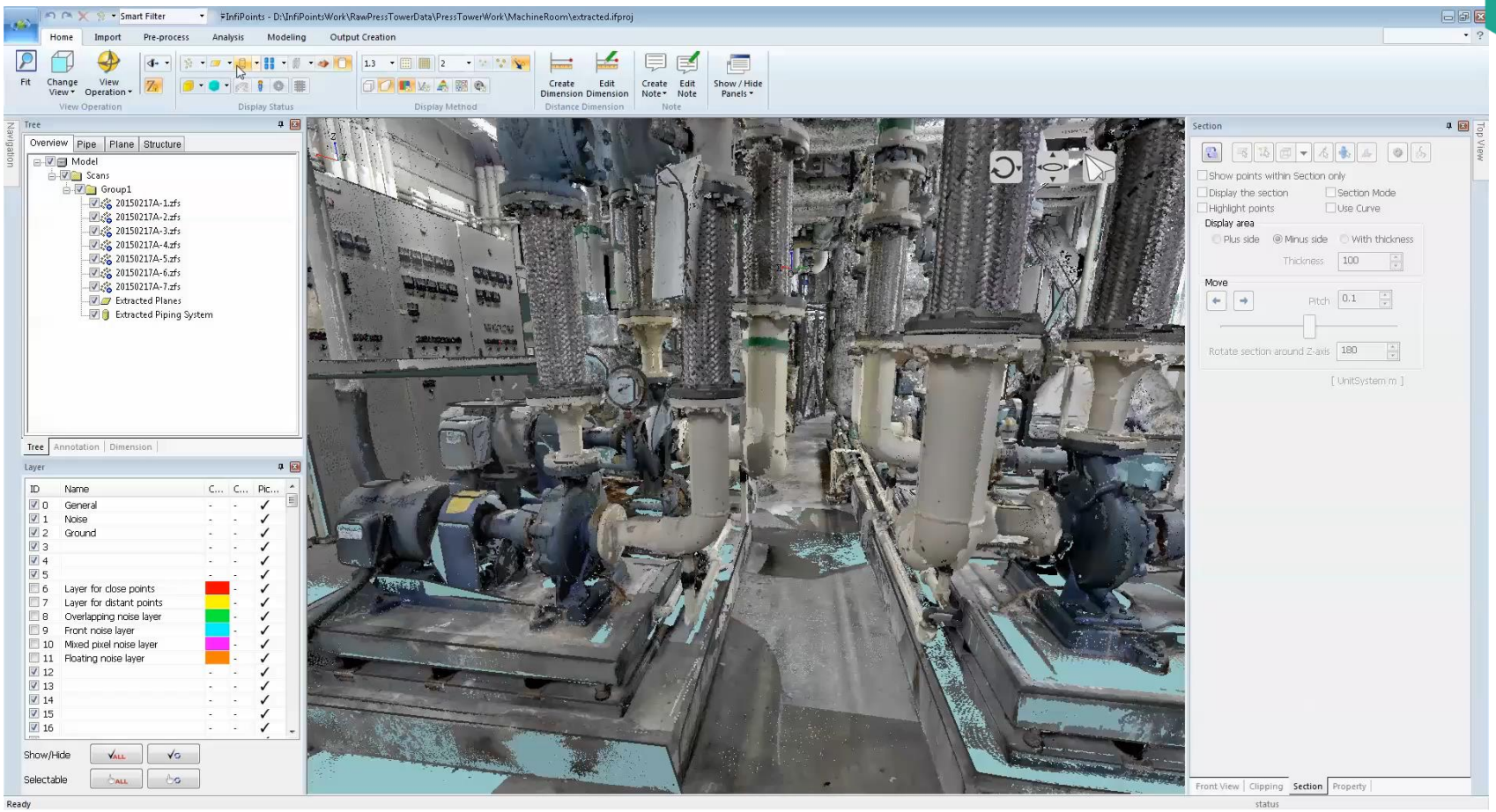

Case Study-Equipment Modeling CAD Connection

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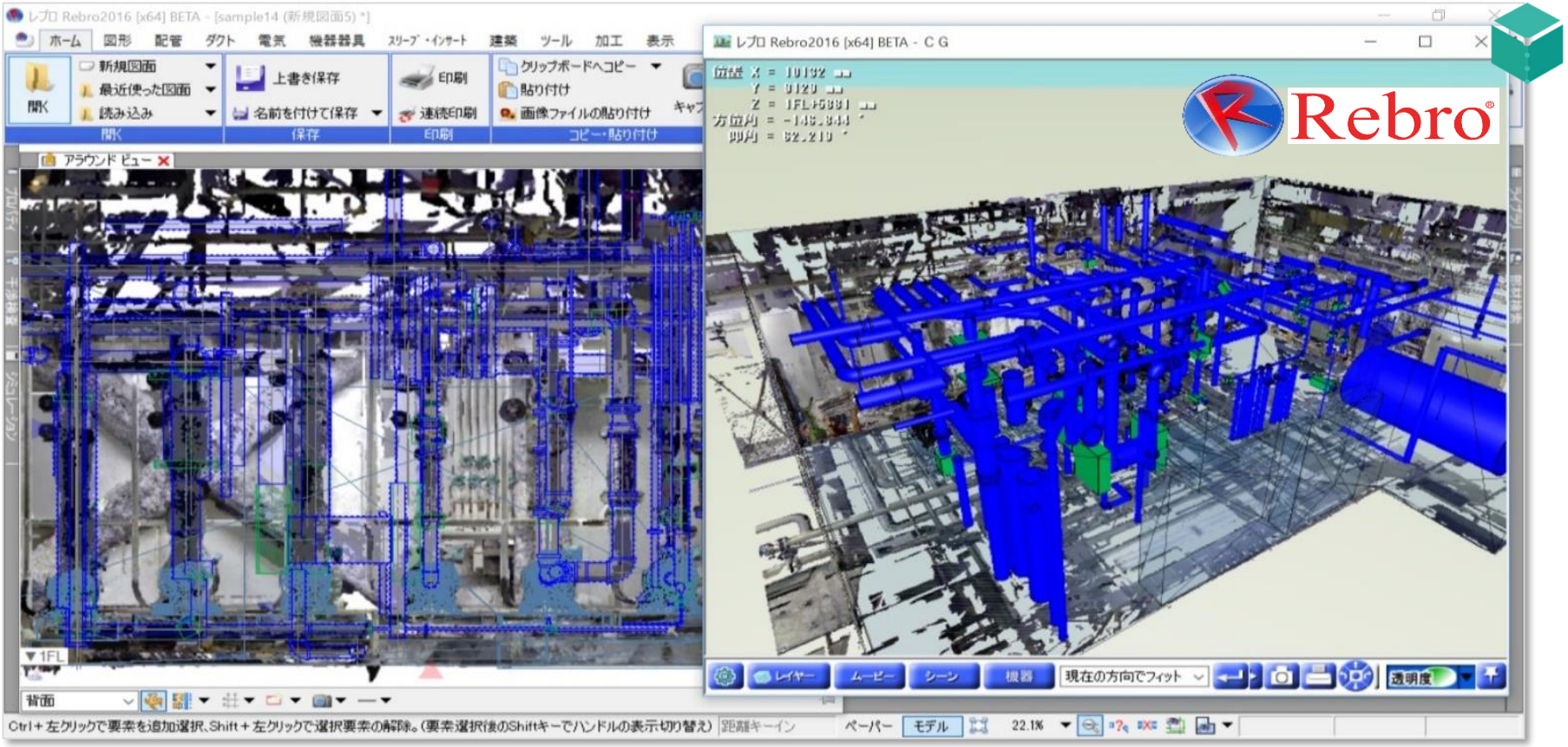
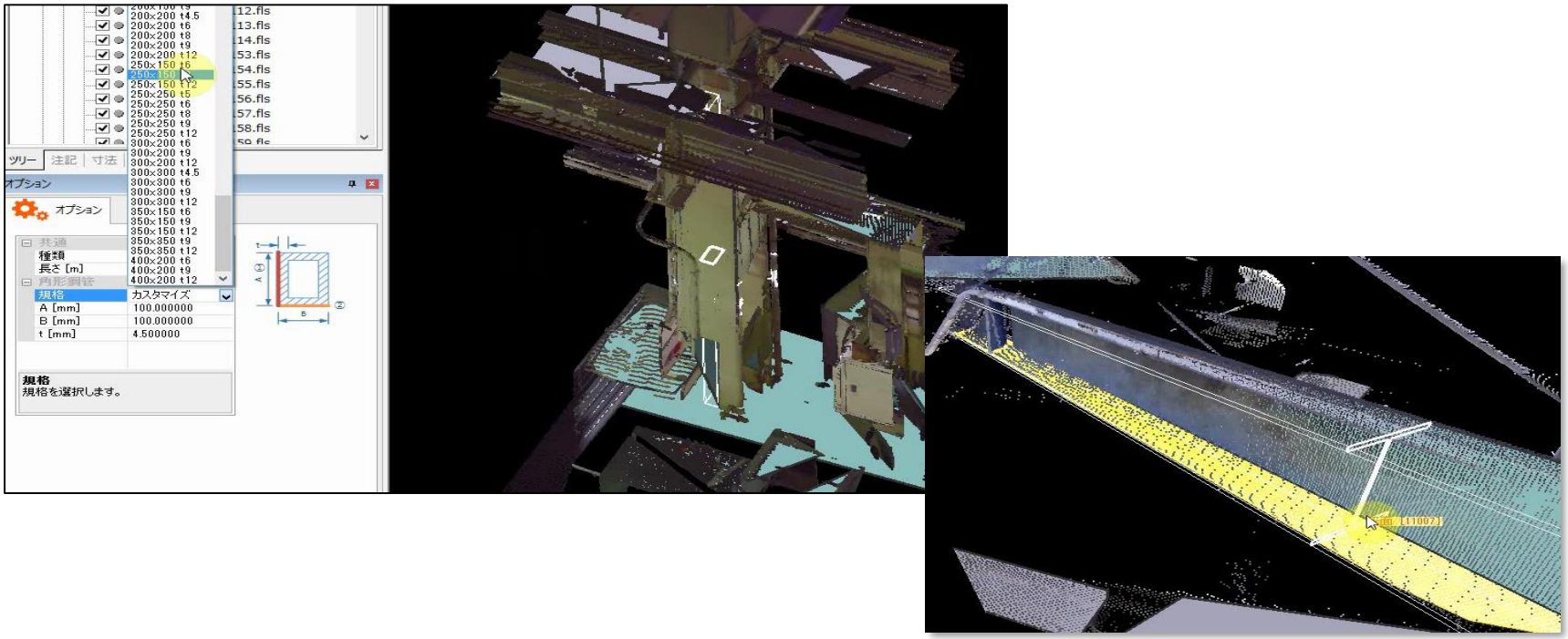


Use automatically extracted planes/cylinders of InfiPoints to complete your workflow in other software

Steel Structure Modeling

Modeling of H-beams, I-beams, etc.



Steel Structure Modeling

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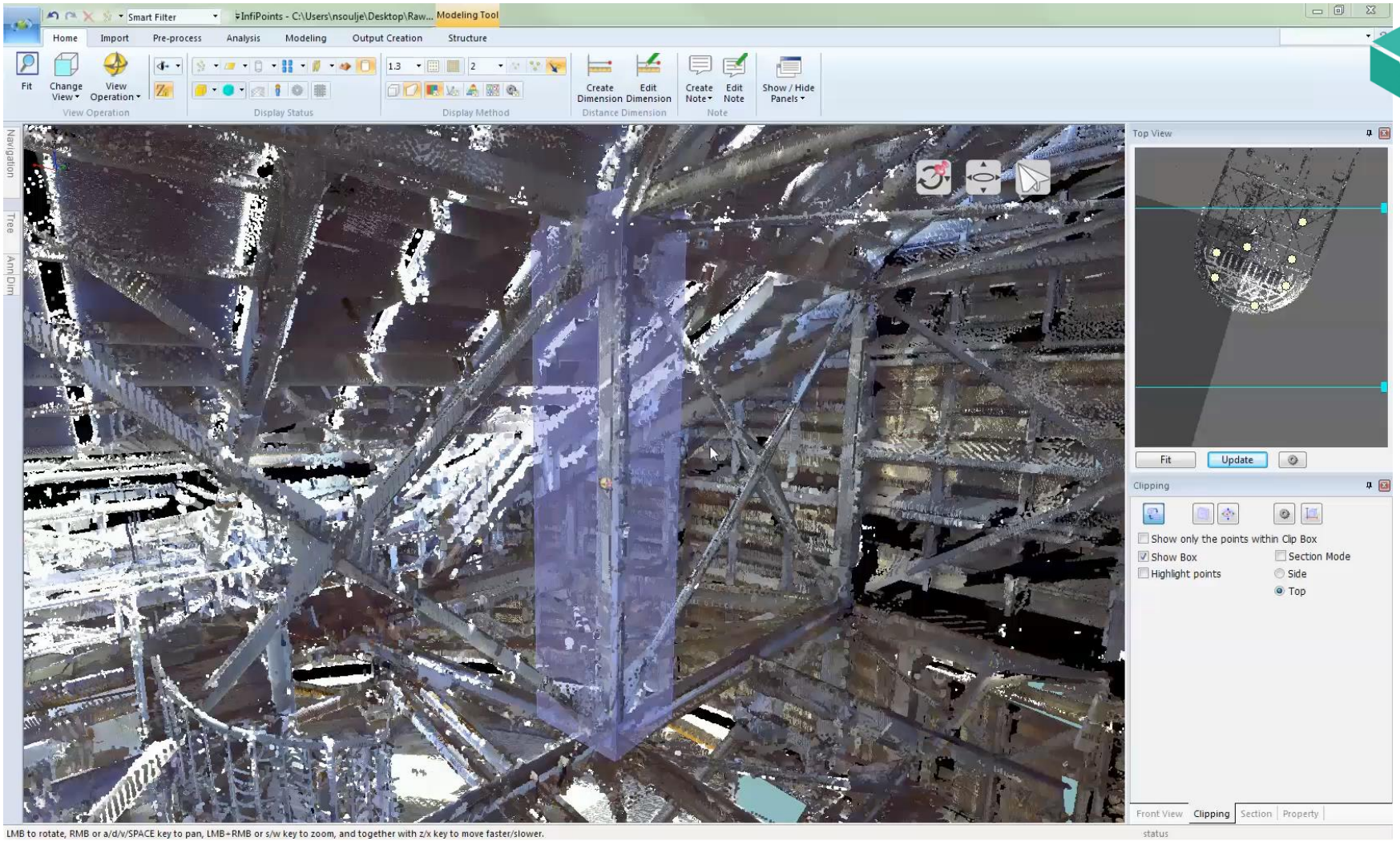
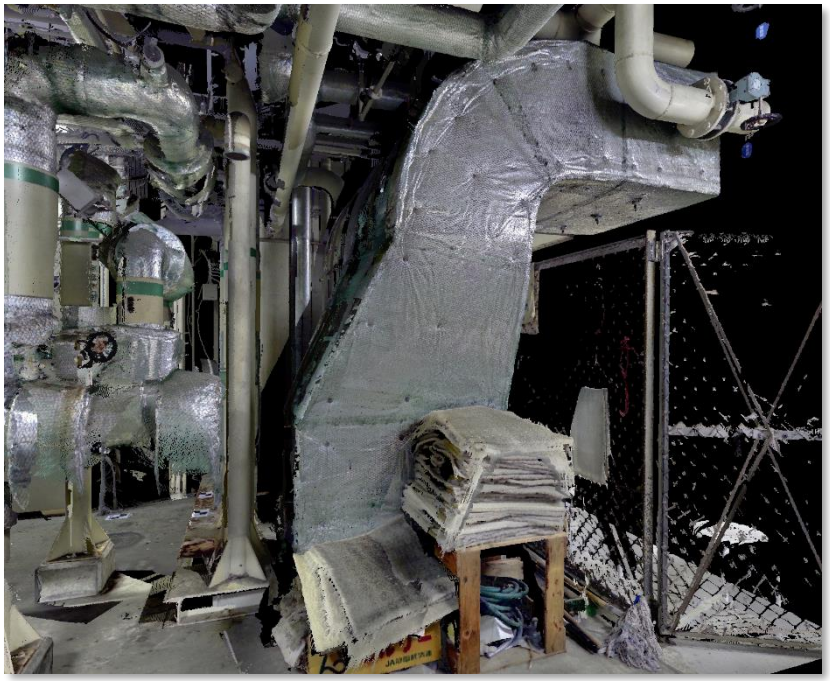
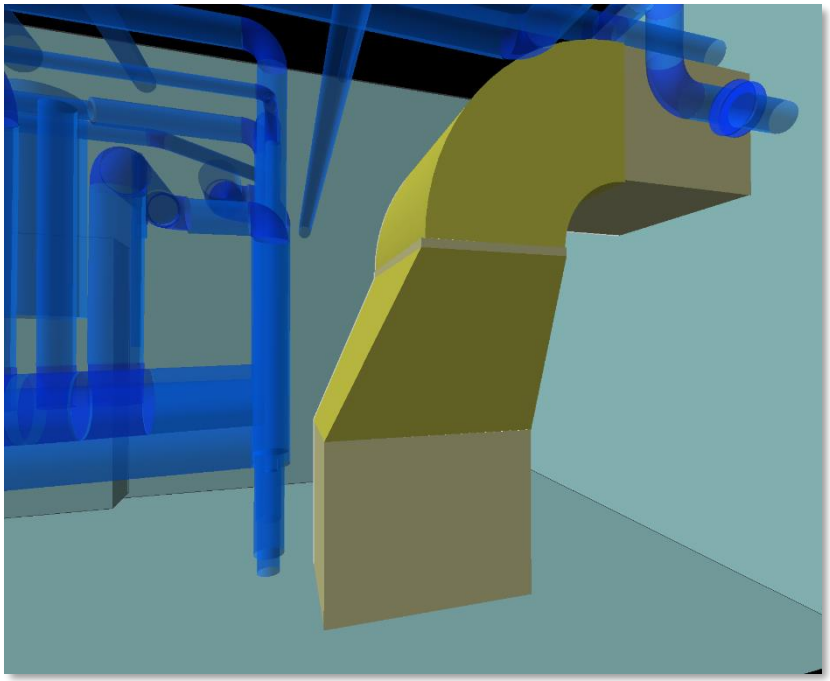


Duct Modeling

Added duct exclusive modeling function utilizing automatically extracted planes





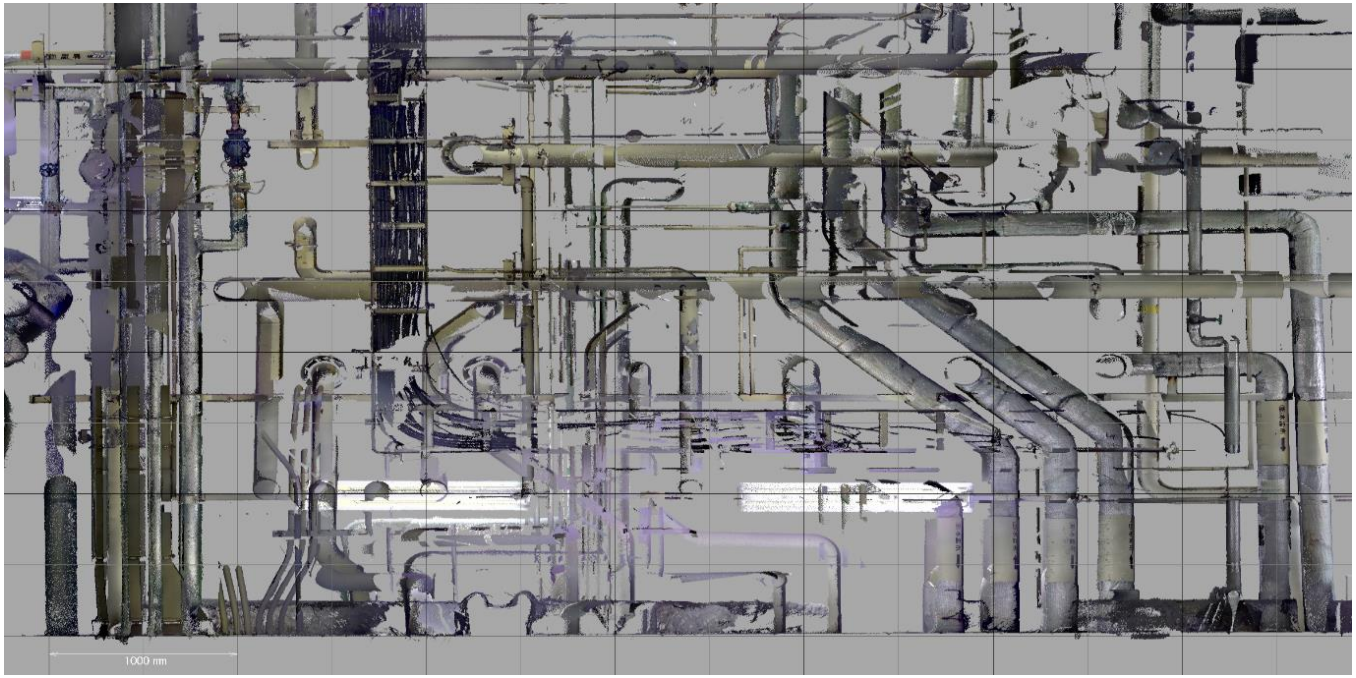
Collaborative Outputs

- **Export Ortho Images**
- **Fly-through Movie**
- **Export Viewer File**
- **External Links**

Export Ortho Images

Specify a reduced scale and export high precision ortho images

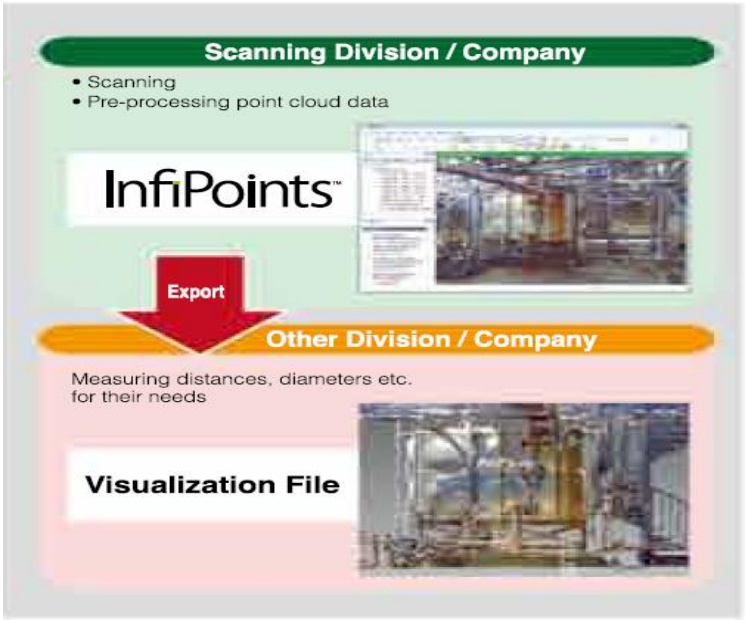
Import into a 2D CAD for drawing creation reference or print it out for information sharing



Fly Through Movie

Export Viewer File

Export a viewer file for distribution to other departments or clients
Point cloud data could be viewed without an installation or the license of the application



<Possible things in the viewer file>

1. Viewing of point cloud, CAD data, notes and dimension
2. Switching view/hide of layers
3. Section movement along a pre-set path
4. Drawing creation, DWG export [*]
5. Ortho image export [*]
6. Adding dimensions [*]
7. Adding notes

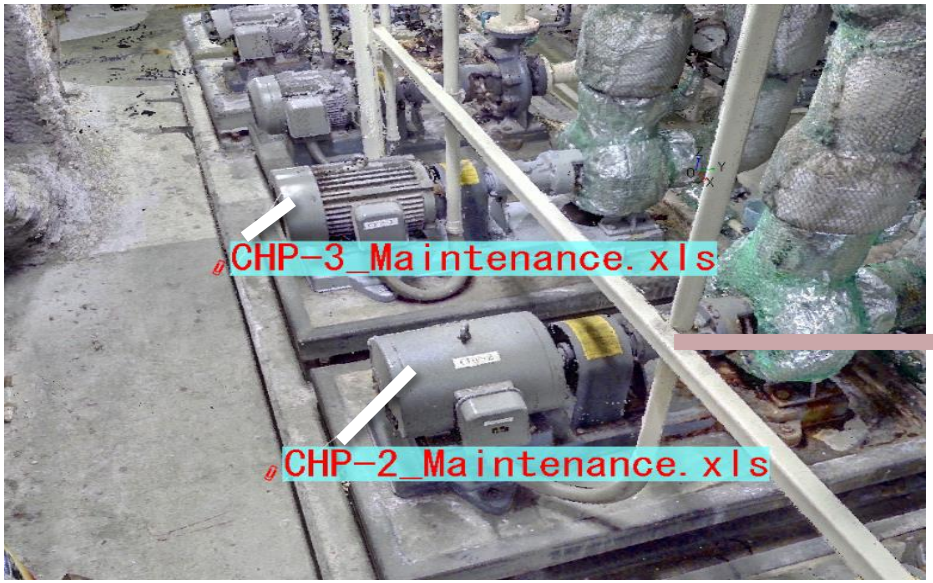
[*] Authority settings could be done at the time of viewer file export

※Point cloud rendering capabilities are the same as that of InfiPoints
※Users could save drawings, notes, and dimensions added in the viewer file

External Link

Add notes and comments on the point cloud

Link saved files (i.e. manuals) or attach a reference hyperlink on the point cloud



External File

Viewer File Demo

Supporting Formats

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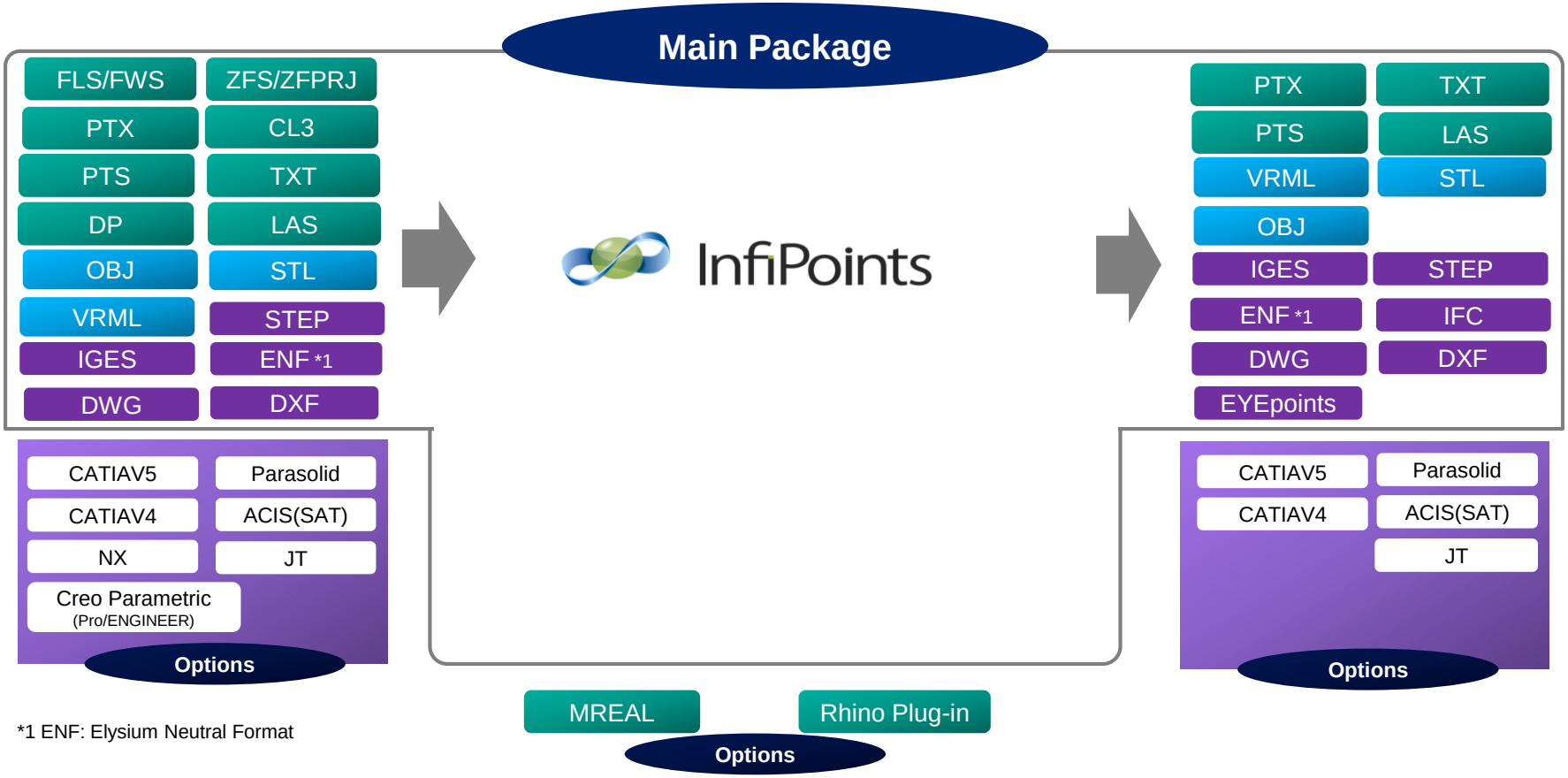


*1 ENF: Elysium Neutral Format

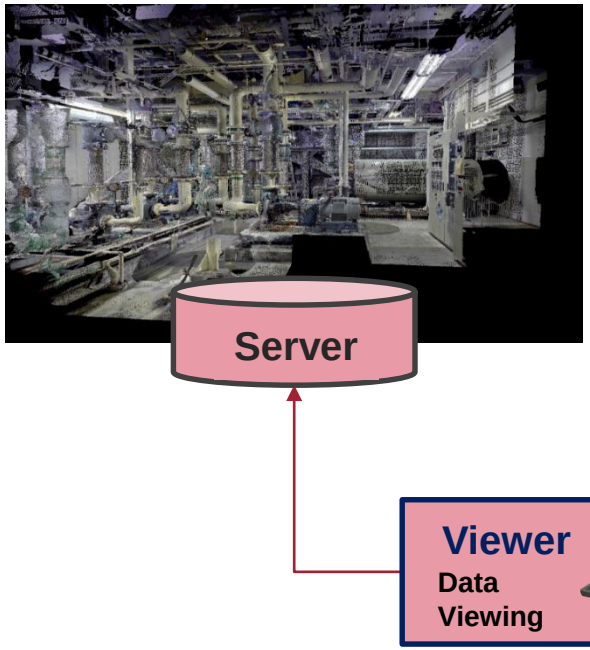
Head Mount Display

Realize the experience using the head mount display (Oculus) to view your scanned point cloud data.

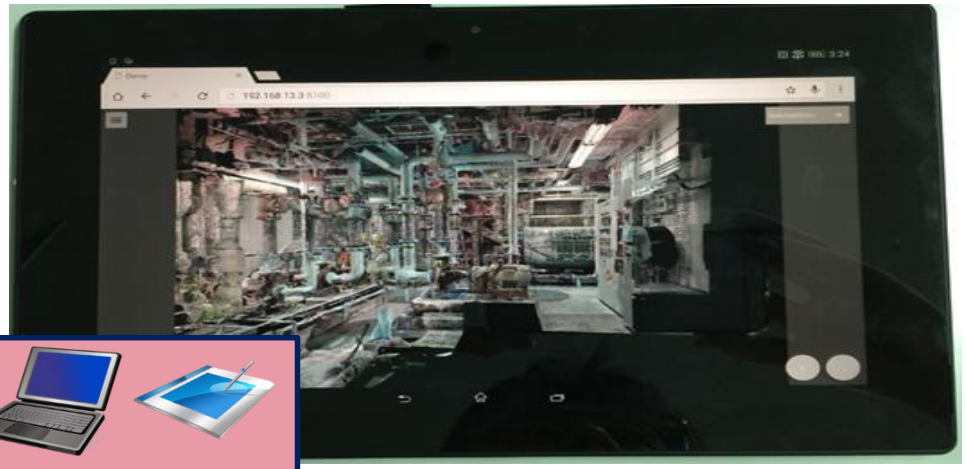
Oculus Rift

Point Cloud Web Viewer

Access the server from the client (PC, tablet, smartphone, etc.) and lightly view your point cloud data



- Access a URL in a web browser to view your point cloud
- Software installation is unnecessary on the client side



Customer Case Studies

- **Shinryo Corporation**
  - BIM case
  - 30% reduction in lead-time by utilizing automatic registration, denoising, feature extraction, and the CAD JT export

- **Tonets Corporation**
  - BIM case
  - Utilizing automatic feature extraction, Rebro connection, and IFC export option to other BIM software
    - 2 month process down to 14 days

- **Matsue College**
  - Silver mine investigation
  - Utilized automatic noise reduction and ground extraction

Customer Case Studies

- **Shinko Plantech**
  - Avoid rework by virtually checking for interferences for construction maintenance
  - Utilizing automatic feature extraction, polygons, and collision detection, were able to avoid 30 areas that would have caused interference

- **JFE Plant Engineering**
  - Looking at the inclination of their plants after earthquakes for maintenance
  - Utilizing automatic noise reduction, measurement capabilities, and CAD to Point Cloud validation
    - Saved time, reduced human danger, increased measurement capabilities

Thank You!

Questions?

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