

PanoMap[®] Modeler

Intelligent 3D Modeling from Scans Using PanoMap[®] and Plant/CMS[™] Technology

Automatic Component Placement

One Click Component Fitting

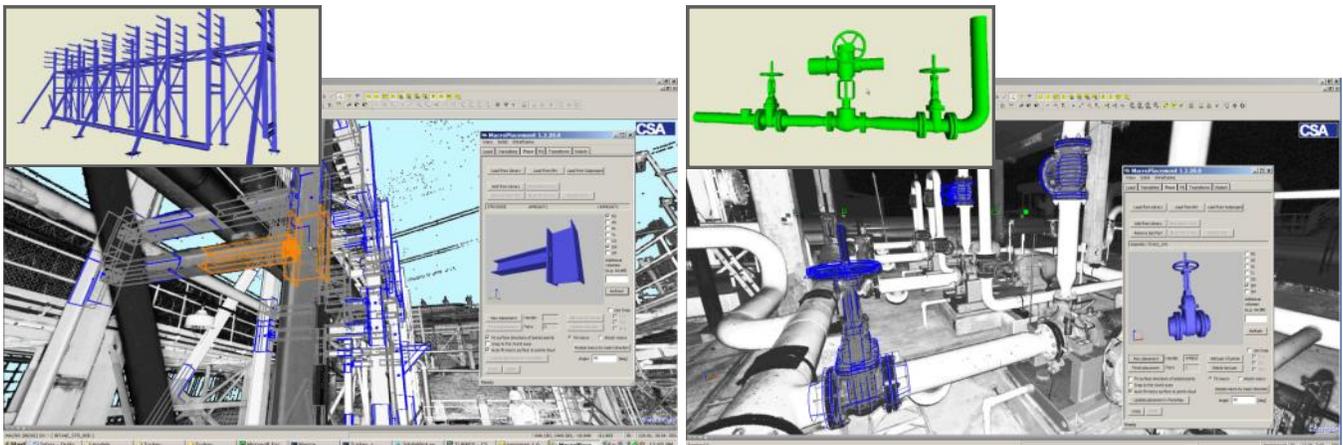
Selection from Comprehensive 3D Specifications and Libraries

Easy Pipe Routing

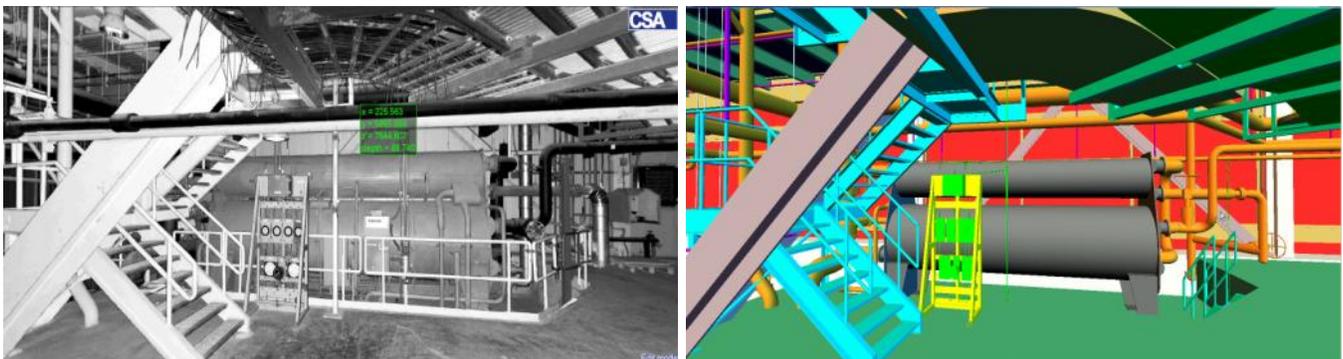
Steel Node Placement

BIM Technology

Conversions to Other CAD Systems



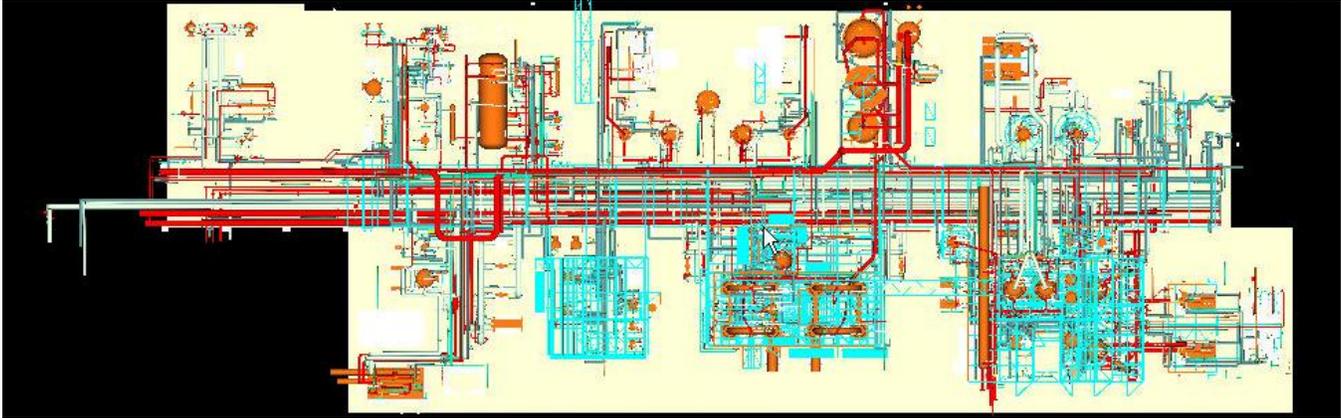
Automatic fitting of library components in PanoMap[®] scan



PanoMap[®] 3D laser scan and 3D model built from scan

Large Scale Intelligent Pipe Modeling from Scans

CSA's laser scanning technology, **PanoMap® Manager** and **Plant/CMS™** (intelligent 3D modeling) provide comprehensive and efficient support for large scale intelligent pipe modeling from laser scans.



The resulting pipe design model is specifications-driven and can be converted to major design CAD systems, including SP3D, PDS, PDMS, Plant4D, etc.



Here are the building blocks of the technology.

Plant/CMS™ provides:

- Comprehensive parametric libraries of piping components
- Pipe Specifications
- Plant/CMS™ 3D database
- Pipe modeling database
- Intelligent P&IDs
- Component database
- ModelReview, PlinView
- Macro modeling facility
- MacroCAD
AutoCAD based library maintenance
- Interference checking
- Model connectivity processing

CSA's PanoMap® Technology provides:

- PanoMap® Manager
- PanoMap® Laser scan database
- PanoMap®
- PanoMapPhoto™
- RouteMan, pipe routing app
- Automatic cylinder fitting
- Automatic pipe object generation
- One Click modeling function
Cylinders, planes, assembly macros, steel shapes

The Pipe Modeling Process

Before an accurate pipe model can be created, comprehensive, high density laser scanning of the facility must be performed. Typically, photographs are also taken to document the piping details.

Laser scans are processed and a database is created. Scans are registered using an automated process that locates objects common from one scan to another. CSA also registers photographs to the laser scan database using the PanoMap-Photo™ software.

Once these scans and photographs are registered, the Pipe Modeling process is performed, as described below.

Automatic Pipe Cylinder Generation

An automated process searches the laser scan database to fit cylinders, which are used to route pipelines.

Cylinders are organized into objects by areas and the pipe modeling database is updated accordingly.

“One Click” Placement of Library Components

A macro modeling function exclusive to PanoMap® is used to quickly and easily place components and component assemblies from CSA’s comprehensive piping libraries into laser scans.

Placement of Equipment Nozzles

Equipment nozzles are placed from the pipe libraries into laser scans, and like all 3D model components, labeled for identification within the PanoMap® project.

Initial Pipe Trajectory Generation

An automatic pipe trajectory is generated to create pipe objects from placed nozzles, cylinders, and in-line components.

Integration with P&IDs

A comprehensive review process is initiated to verify the accuracy of the new 3D piping model, which is integrated with P&IDs.

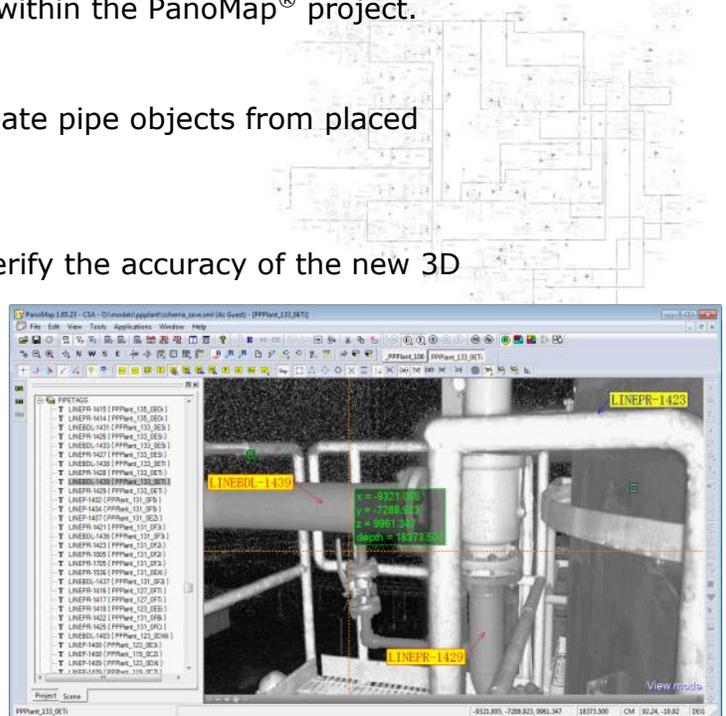
Editing and Pipe Consistency Verification

PanoMap® is used to edit the pipe trajectory objects, which include

- Corrections to pipe connectivity
- Editing of cylinders, in-line components, and nozzles
- Addition of pipe attributes, specification, nominal size, user ID, and change of admin control records

Pipe Trajectory objects are extracted into a spreadsheet, where piping objects can be added or modified.

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**Labeling in PanoMap®
for intelligent integration
of P&IDs and scans**

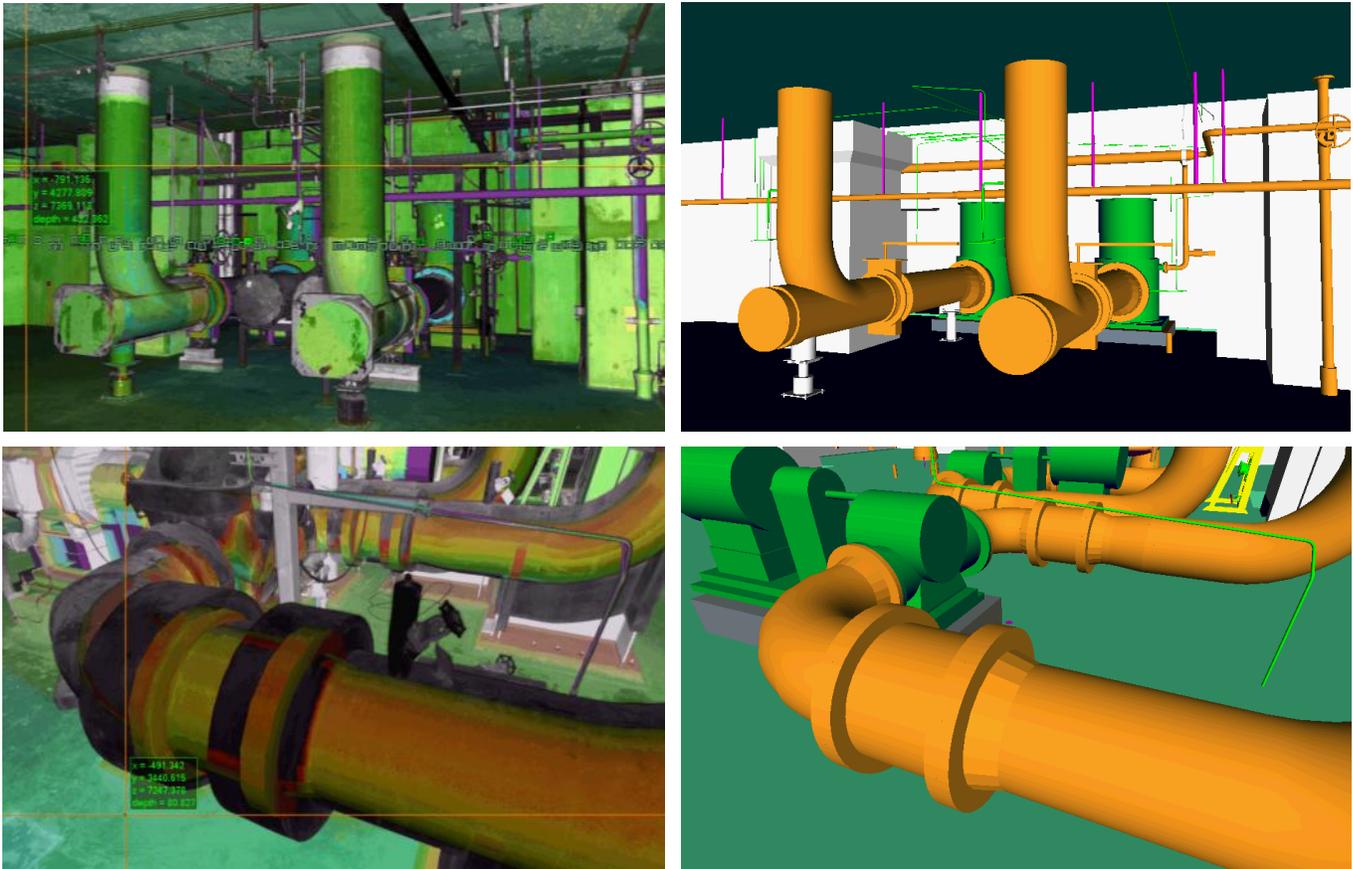
The Pipe Modeling Process *continued from << previous page*

Automatic Pipe Routing

An exclusive RouteMan™ process is used to automatically route the pipelines. This can be used interactively within selected objects in PanoMap®, or as a batch process of a particular list of piping objects.

Once the piping objects are processed, they are updated into the Plant/CMS™ model master database. The resulting pipe 3D model is also verified for interferences (clashes).

Color-Coded Verification of 3D Model into Scans



3D models (right) are merged into laser scans (left). Colors (left) depict discrepancies between the 3D model and the laser scans.

Color mapping legend for as-built (scan) to 3D model as implemented in scans shown above

RICH	TID	COLOR	ALPHA	Int_color	Int_alpha	Graden
0.0F	-4.000	Red	0.50			
-4.000	-3.500	Orange	0.50			
-3.500	-3.000	Yellow	0.50			
-3.000	-2.500	Light Green	0.50			
-2.500	-2.000	Green	0.50			
-2.000	-1.500	Light Blue	0.50			
-1.500	-1.000	Blue	0.50			
-1.000	-0.500	Dark Blue	0.50			
-0.500	0.500	Light Blue	0.50			
0.500	1.000	Light Green	0.50			
1.000	1.500	Green	0.50			
1.500	2.000	Light Green	0.50			
2.000	2.500	Green	0.50			
2.500	3.000	Light Green	0.50			
3.000	3.500	Green	0.50			
3.500	4.000	Light Green	0.50			
4.000	+0.0F	Blue	1.00			

Further verification is provided with merging of the 3D pipe model into laser scans, and verification between the 3D model and laser scan database. The system will **automatically color the laser scans** if the surface distance between the pipe model and laser scans is more than the specified tolerance. The resulting intelligent piping model is converted to other CAD systems such as SP3D, PDS, PDMS, and others.

Similar intelligent modeling processes can be applied to other design disciplines.