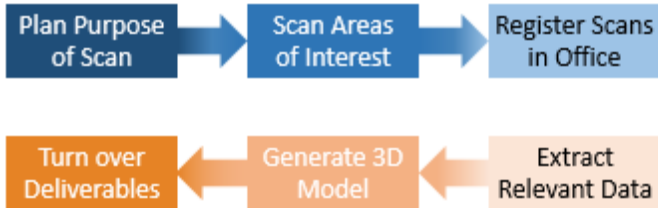


3D Scanning – Overview

I/O Design typically utilizes a Leica RTC360 scanner paired with Cyclone Registration and Model software. The scanner is utilized in the field to obtain a 3D point cloud of all the objects within line-of-sight up to 130 meters from the unit. The scanner collects up to 2 million points per second to obtain a full 360° point cloud in under 2 minutes.

Workflow



Accuracy

3D Point Accuracy:

- 1.9 mm @ 10 m
- 2.9 mm @ 20 m
- 5.3 mm @ 40 m

Best fit algorithms enable modelled surface precision of 0.5 mm*.

*Based on tests completed by I/O Design

Field Conditions



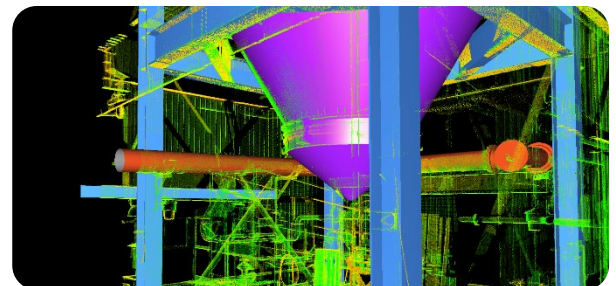
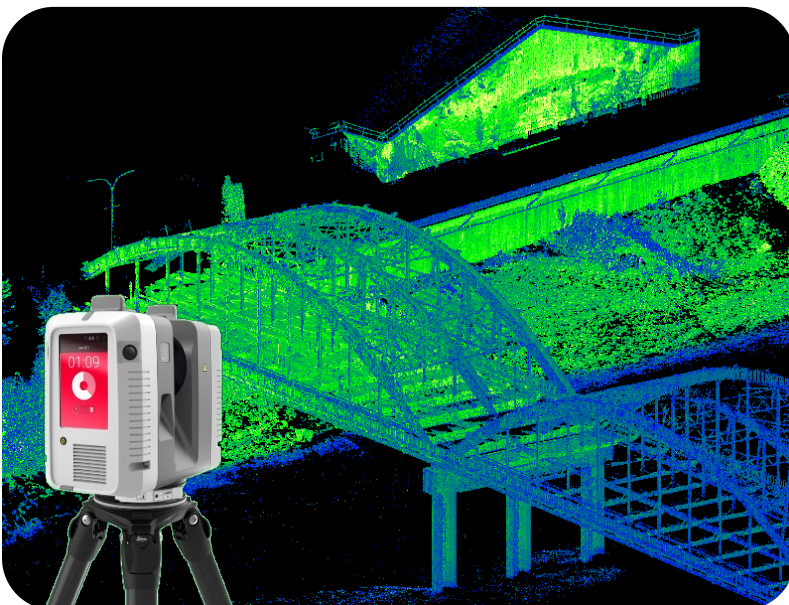
The machine does not like to get wet or dusty and will only run if the ambient temperature is between -5°C and 40°C.



Remote operation allows measurements to be taken in inaccessible or hazardous areas without endangering life.

Applications

- Measurements
- Modelling Existing Equipment
- Deformation and Movement Monitoring
- Clash Detection
- Volumes and Topography



Leica RTC360



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3D Scanning – Modelling

Leica Cyclone is a very powerful software tool I/O Design uses for modelling pipe components, steel beams, and some primitive objects such as boxes and patches from point cloud data. These objects are fit to the point cloud using best fit algorithms that reduce error to 0.5 mm*. When modelling pipe components and steel beams, Cyclone utilizes a parts table to model standard sizes.

Fit to Cloud

- Patch
- Cylinder
- Sphere
- Box
- Cone

Piping

- Pipe
- Elbow
- Mitred Elbow
- Flange
- Valve
- Concentric reducer
- Eccentric reducer

Steel Beams

- Angle
- Channel
- Tee
- Wide Flange
- Square HSS
- Rectangular HSS

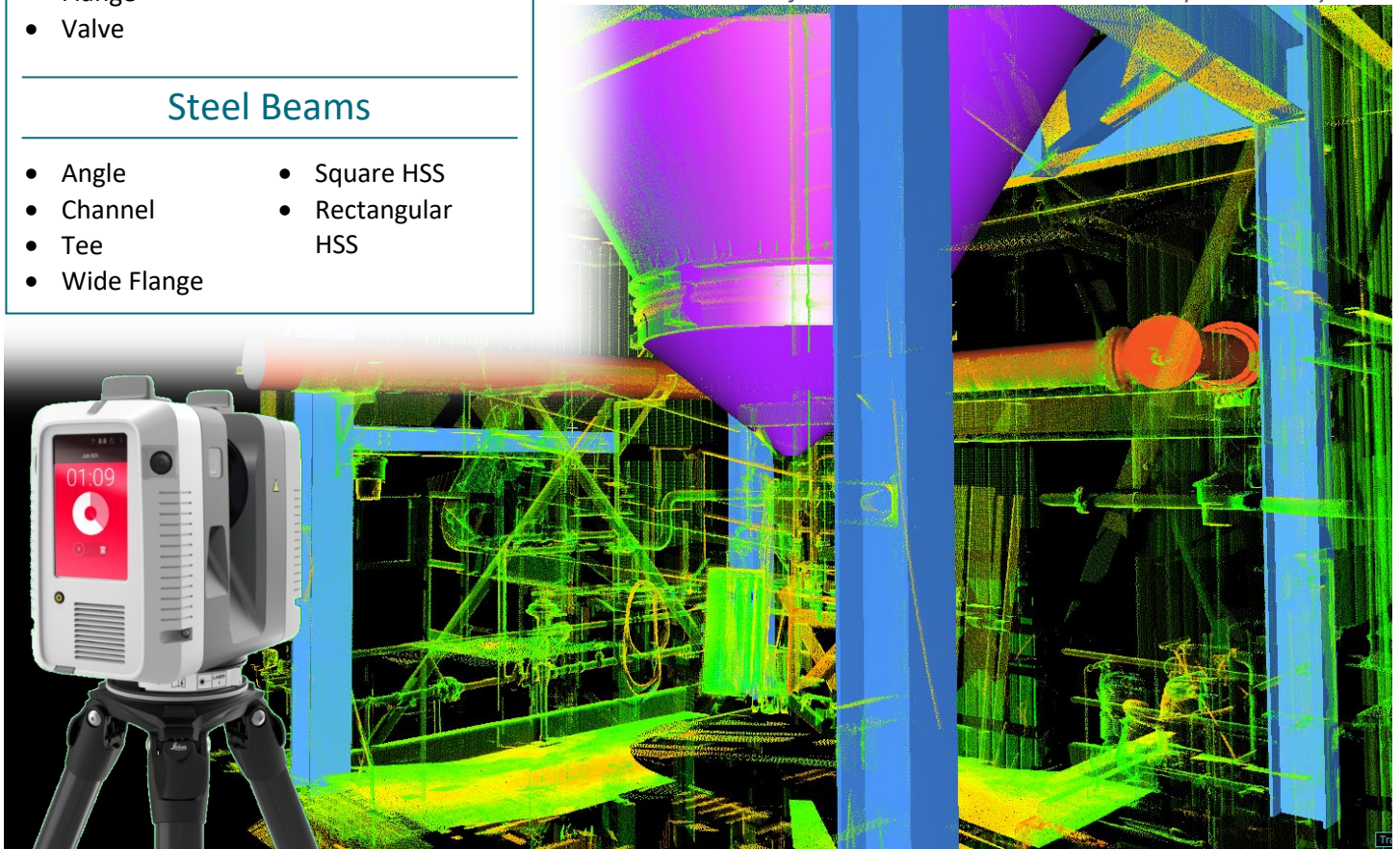
Within Cyclone, modelled objects can be used to:

- locate objects relative to a user-defined coordinate system
- take accurate measurements between objects
- determine the centrelines of pipe

The model can also be exported to AutoCAD or Autodesk Inventor to be used in the design as existing reference geometry.

*Based on tests completed by I/O Design

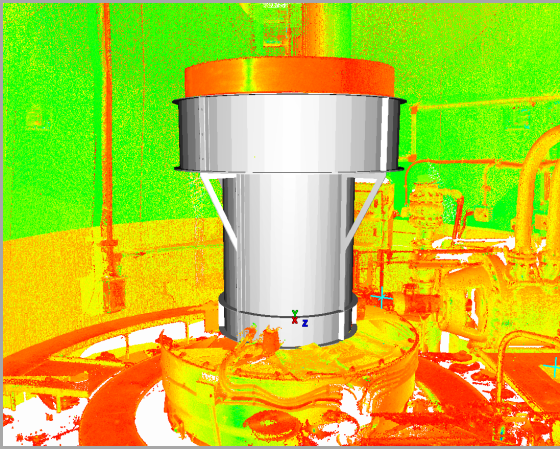
Scan of industrial site with modelled components – Cyclone



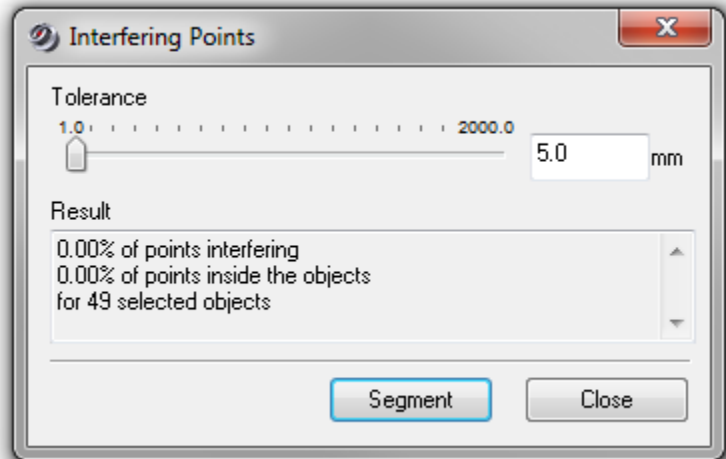
3D Scanning – Clash Detection

When using a measuring tape, it can be very easy to miss a dimension. I/O Design utilizes a Leica 3D scanner to create a point cloud of an area in which the distance can be measured between any two points. This reduces return site visits due to missing data. It also provides a method of checking for interference between existing and newly designed equipment.

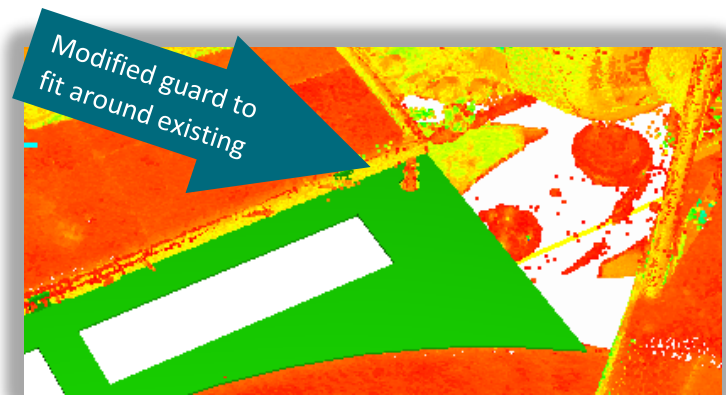
By importing models into Leica Cyclone software, the fit to existing equipment can be visually checked against the point cloud. The software also provides a value for the percentage of points that lie within a defined distance from the model.



Turbine shaft guard at hydro-electric facility



Scanning can also be done following fabrication and then checked against the model and scan data to ensure it will fit in the field prior to delivery.



Wicket gate linkage guarding at hydro-electric facility



Leica RTC360



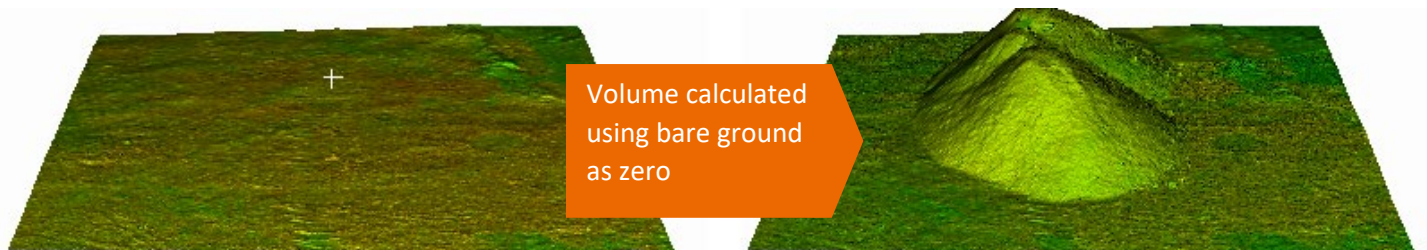
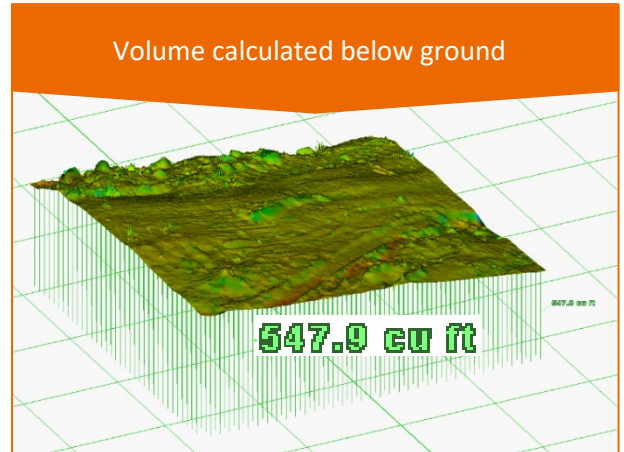
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3D Scanning – Volumes & Topography

Traditionally, stockpile volumes are either measured by surveying points of the pile or calculated based on the height and diameter. Utilizing a 3D scanner, I/O Design can provide accurate volumes based on the entire surface of the pile.

Within Leica Cyclone, a mesh is created from the point cloud and the volume is then measured between the mesh and a reference plane. For an excavation, the reference plane is set to a defined depth. For a stockpile, best results are obtained if the ground can be scanned prior to the material being dumped. If this is not possible, the reference plane can be best fit to the ground.



Mesh of ground and pile – Cyclone

Contour lines can be generated from the mesh to create a topographical map.

