

ROV3Di

Real-time 3D Imaging +
Photogrammetry



Business at a glance

Ashtead Technology is a leading provider of equipment rental, advanced underwater technologies & integrated support services to the global offshore energy sector

Over **39** years
experience



£161m
cost of rental fleet



22,500 +
rental assets



8 acquisitions
since 2017



Supporting the
renewables
and **oil & gas**
markets



3
expanding service
lines



520+
employees
globally



Supported customers in over
80 countries



£123m
FY2022 revenue ⁽¹⁾



£50.1m
FY2022 EBITDA ⁽¹⁾

Invested circa
£20m
in rental fleet capex



Safely delivered
engineered
solutions on over

430
projects

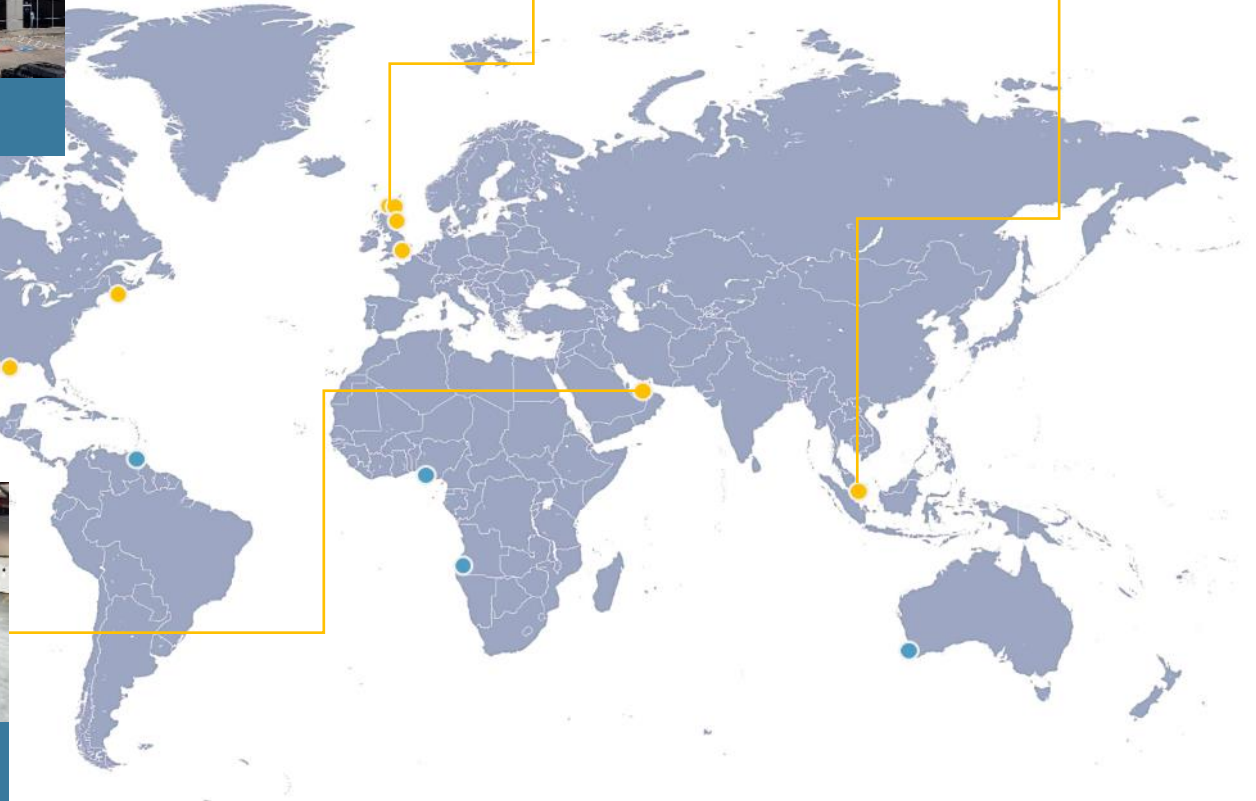


(1) FY2022 proforma

Where we operate

Strategically positioned to deliver for our customers through local support in key energy regions

Ashtead Technology employs more than **520** people and services its customers from **eleven** facilities located in key international energy hubs in the **UK, Norway, USA, Canada, UAE** and **Asia Pacific**



What are 3D models and why are they important?

A 3D model is a digital replica of physical object, consisting of a collection points in 3D space.

Often referred to as a “Digital Twin”.

Can take the form of a 3D Point Cloud or a Mesh (surface overlaid onto a 3D point cloud).

3D models can be used for basic visualisation of an area or structure up to sophisticated engineering.

What are 3D models used for in underwater engineering?

Site characterisation

Survey technologies & autonomous solutions for data acquisition

Construction & installation

Asset integrity solutions that provide actionable, timely and relevant data

Operations & maintenance

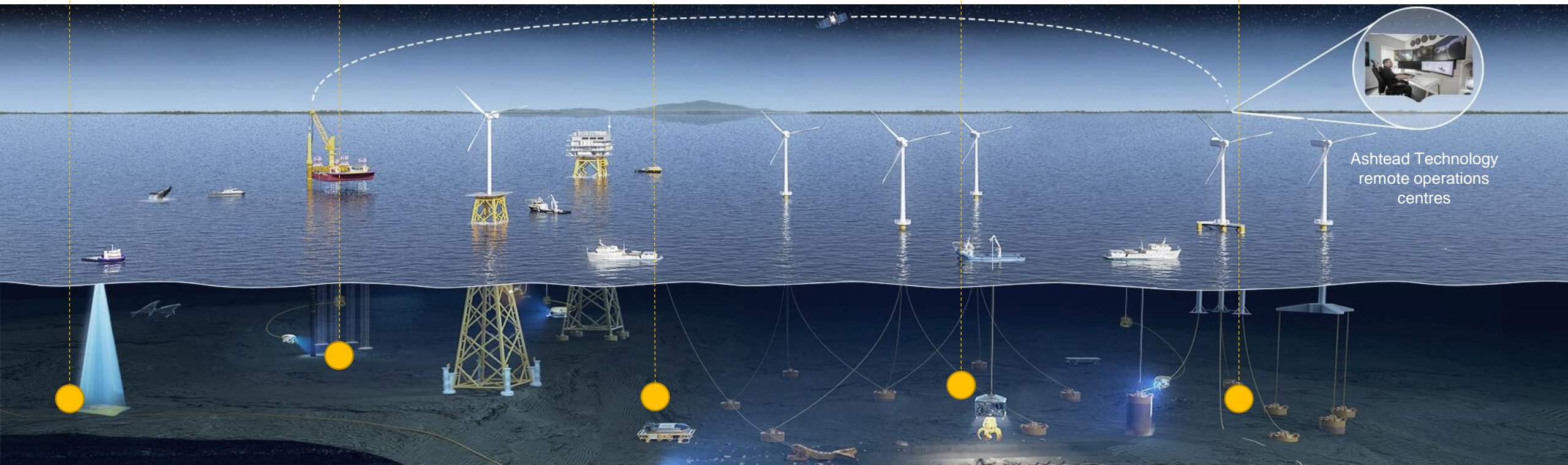
Subsea technologies and services for inspection, repair & maintenance

Life extension

Technologies & methodologies to prolong the life of subsea assets

Decommissioning

Specialist equipment & services for the removal of ageing infrastructure

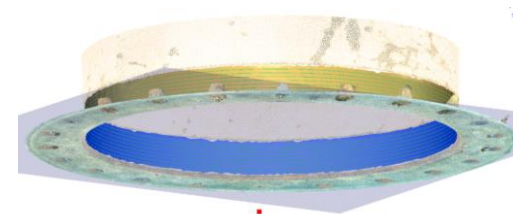
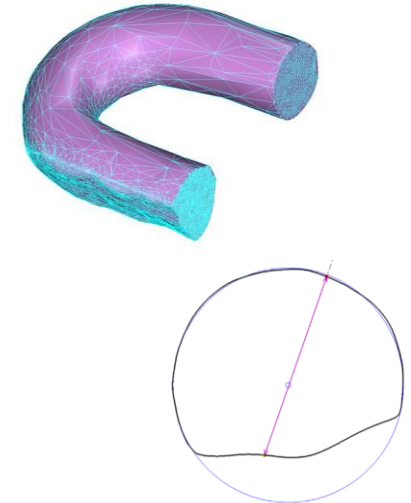
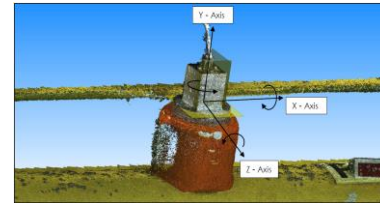
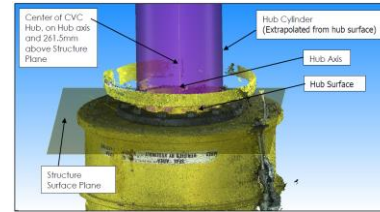
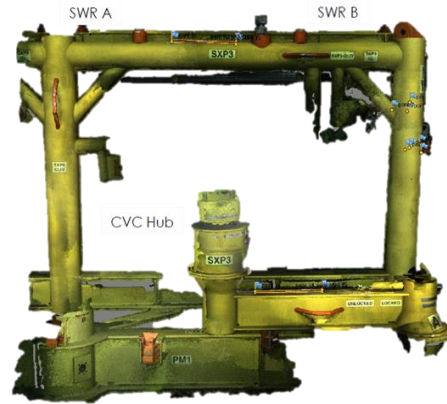


Ashtead Technology
remote operations
centres

What are 3D models used for in underwater engineering?

Applications:

- Design, Construction, Installation
- Inspection, Integrity Management
- Aging Infrastructure, Repair & Replacement

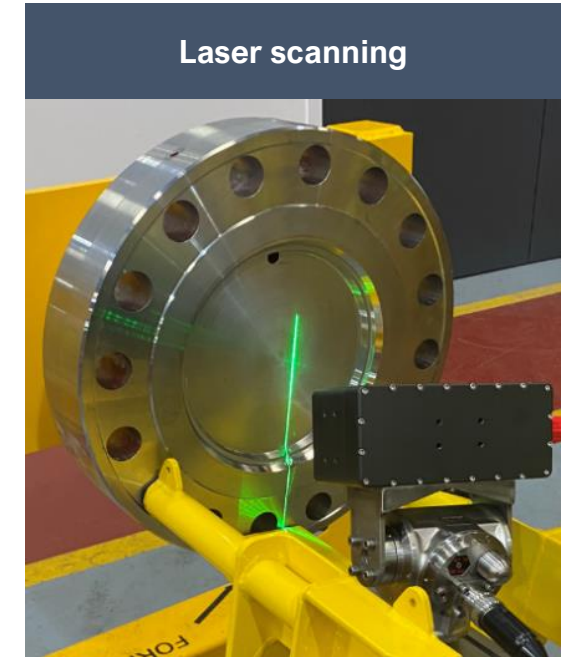
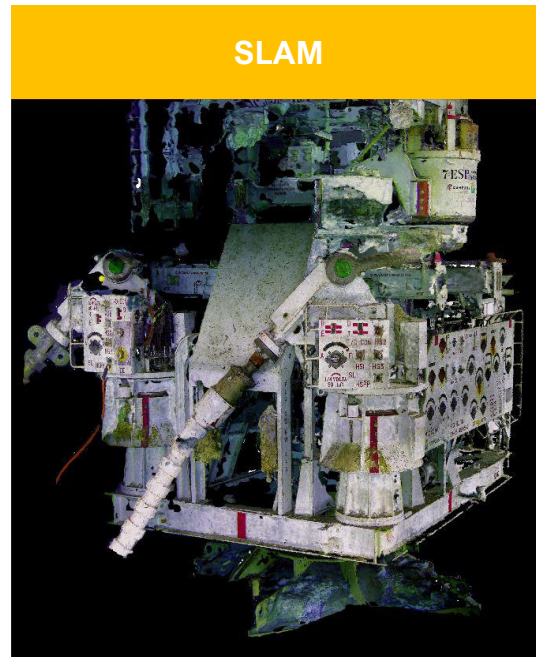
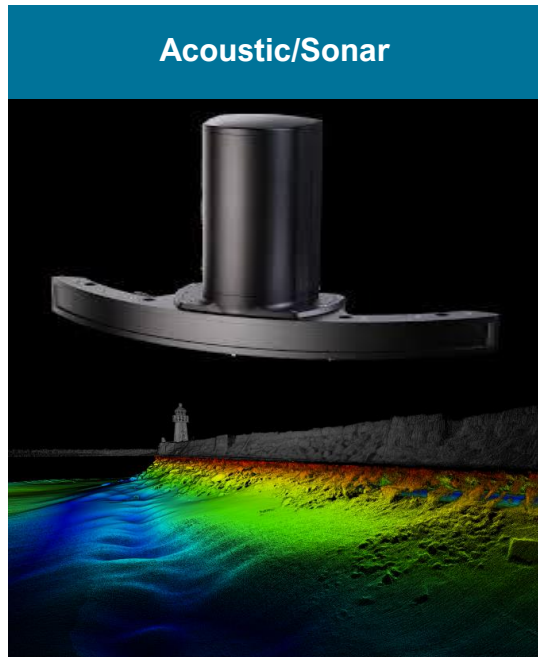


Underwater 3D Imaging Technology

Ashtead Technology is the most versatile provider of Subsea Imaging and Metrology services, with 25 years of reputation built in offshore **O&G**, **civil infrastructure**, and **renewables**.

We deliver an extensive array of subsea imaging and metrology solutions, covering a range of subsea applications and ambient conditions.

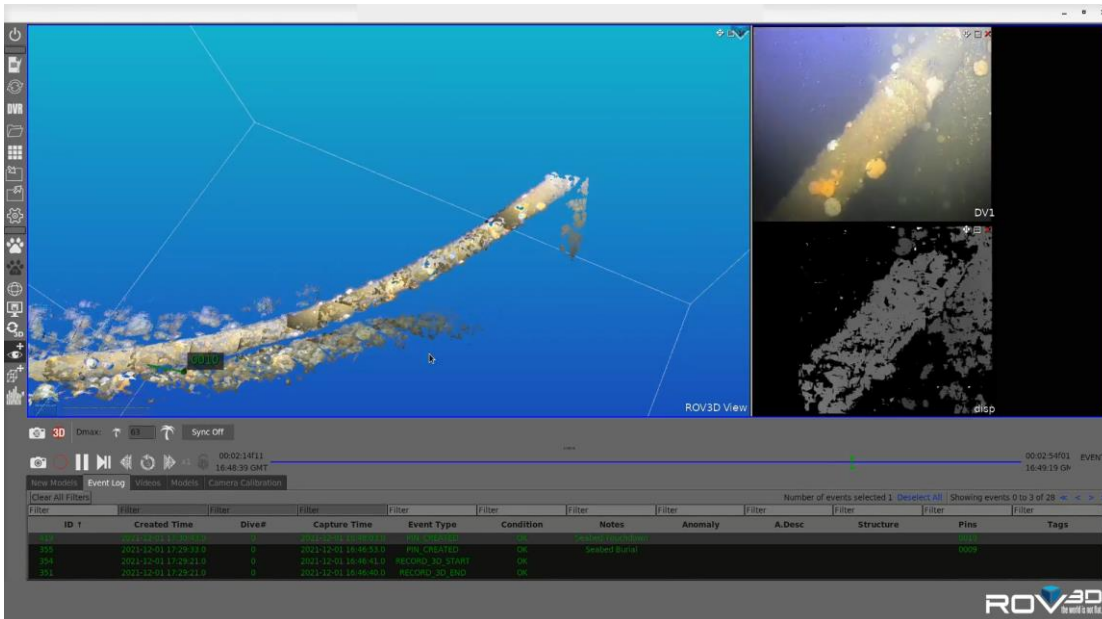
There's no perfect technology for every application, however, SLAM (simultaneous localisation and mapping) and Photogrammetry tend to be the best options for ROV-based 3D imaging for Construction and IRM.



SLAM – Simultaneous Localisation and Mapping

Real-time 3D reconstruction for in-situ modelling and measurement

ROV3D Recon, from Whitecap Scientific, is a 'plug and play' computer vision solution that transforms subsea video collected by remotely operated vehicles (ROVs) into real time 3D data using SLAM.



Cable protection system; wind turbine array cable

Key features:

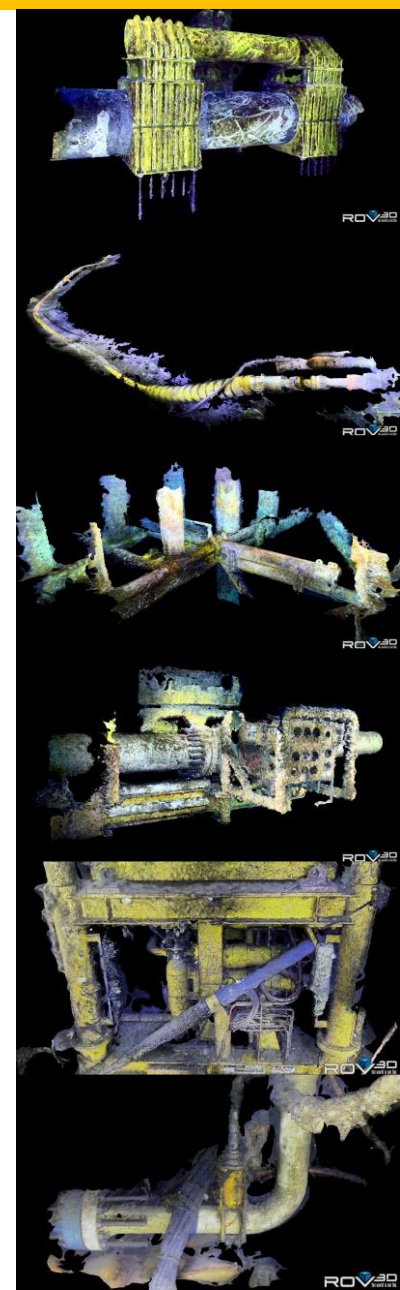
- Live 3D reconstruction
- No specialised personnel required
- Compatible with a variety of SD or HD cameras
- 5-10mm model resolution, $\pm 1\%$ model accuracy

Applications:

- Enhanced inspection tool for reliable measurement
- Monitoring progression of defects
- Spatial awareness, visualisation
- Eliminates wide error margin of visual estimates



Stereoscopic SD video cameras



Photogrammetry

High-accuracy, high-resolution 3D modelling for detailed engineering

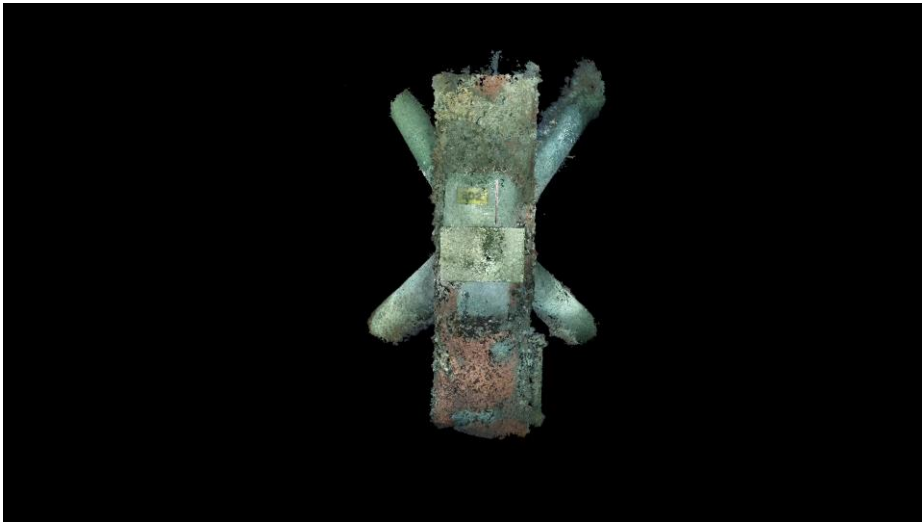
Ashtead Technology is a world leader in Photogrammetry, providing full project services including ROV/Diver/RAT equipment, operating personnel, and data processing/analysis.

Key features:

- Fast, flexible data capture
- Full colour models for detailed visual assessment
- Post-processed results of $\pm 0.2\%$ accuracy; sub-millimetre resolution

Applications:

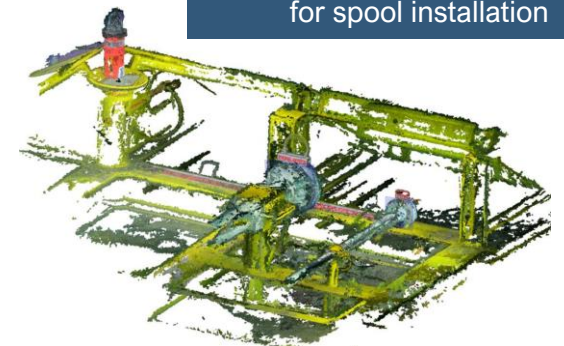
- Construction and installation
- Repair and replacement
- Detailed engineering assessment



Photogrammetry Model;
for Riser Caisson installation



Tree and valve structures
for spool installation



Stereoscopic stills
camera system

ROV3Di: Combined SLAM + Photogrammetry

Live 3D reconstruction and intelligent photogrammetry data collection



ROV3D
Real-time 3D



ROV3Di



Rayfin Cameras
and LEDs



Intelligent, fast 3D data collection system with two-tier resolution/accuracy.

- Live 3D reconstruction
- Rapid digital image collection
- Digital stills captured simultaneously with Live 3D for post-processed photogrammetry



ROV3Di System

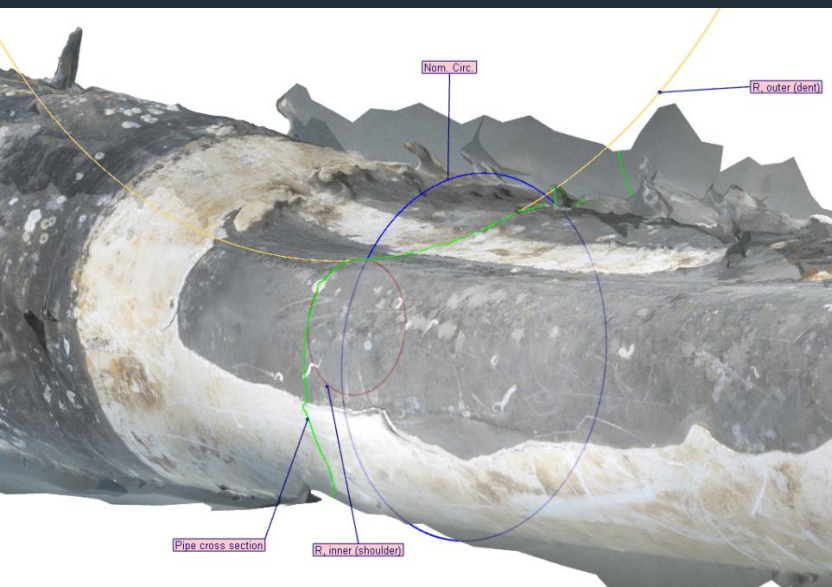
How it Works?

- Stereoscopic cameras for simultaneous HD video and 12MP digital stills images
- Live model accuracy to ~1% and 5-10mm resolution
- Digital stills images may be used for processed photogrammetry models, with linear accuracy of +/-0.2% and sub-millimetre resolution

Compatible with mini-ROVs through Work Class ROVs

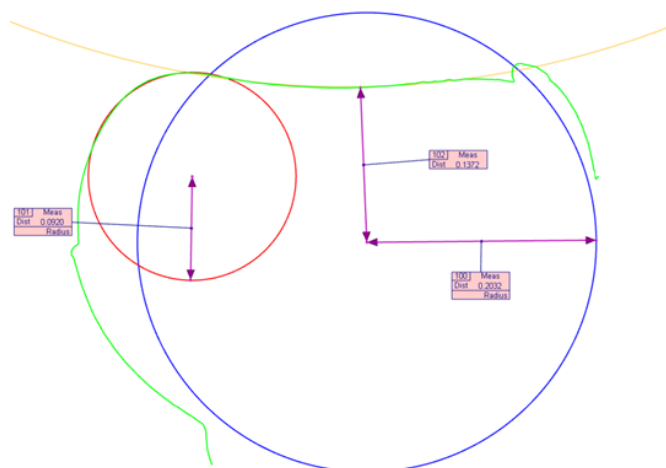
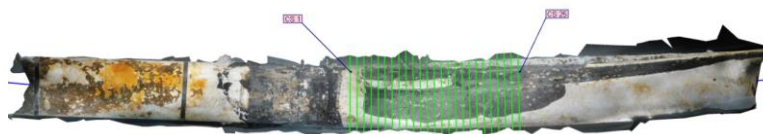
Case study: ROV3Di

Damaged pipeline assessment



Background >

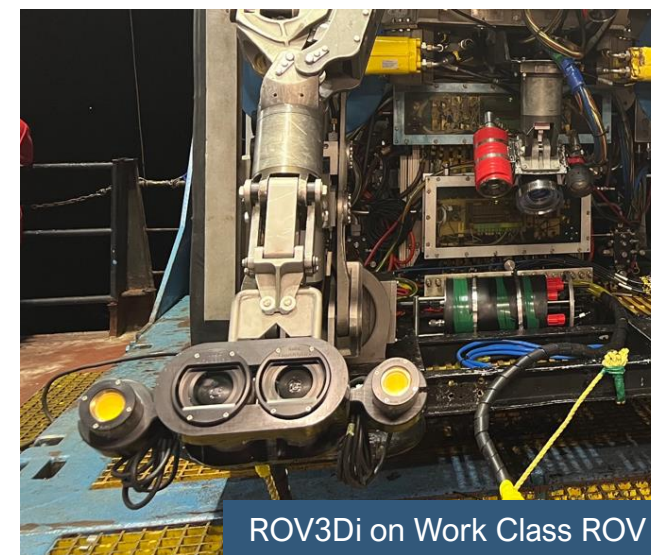
Following an anchor drag incident, a pipeline operator required detailed measurement of pipeline geometry support a decision to return the pipeline to service.



Circumferential dent profile

Solution >

- Ashtead Technology used ROV3Di system to create a high-resolution, high-accuracy model of the damaged section of the pipeline.
- The 3D model showed no appreciable scratches and gouges but revealed more severe deformation than measured by previous methods.
- Live analysis sessions with the pipeline operator to deliver key information critical for returning the pipeline to service.
- All processing and measurement analysis is performed in-house, allowing delivery of results on tight timelines.



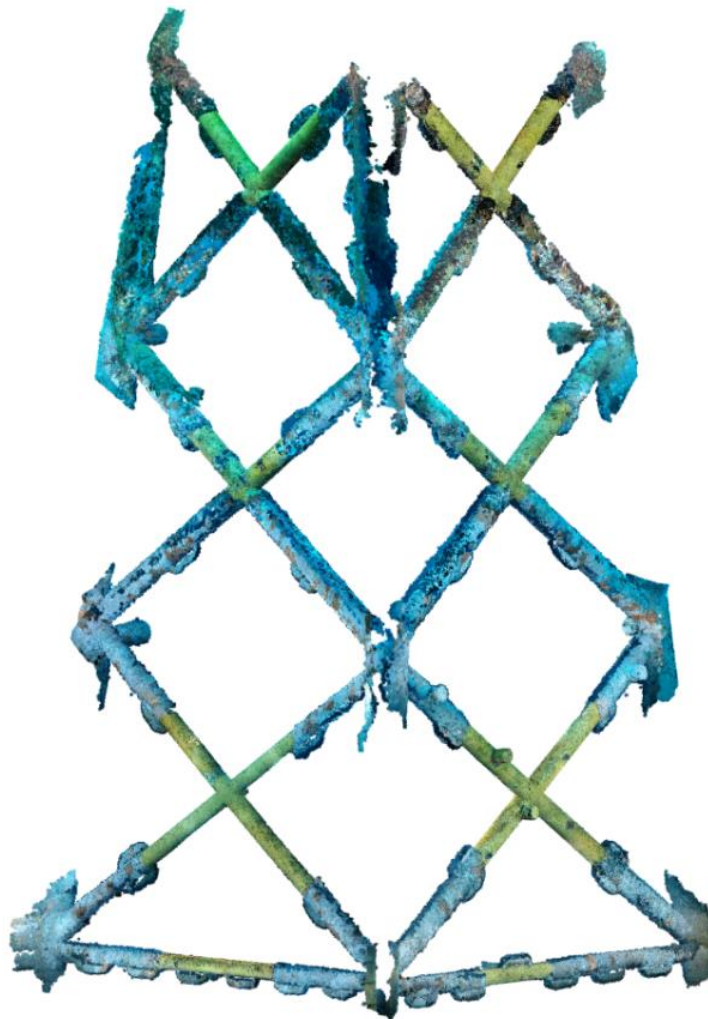
ROV3Di on Work Class ROV

Case study: ROV3Di

Jacket modelling for riser installation



Jacket model #1



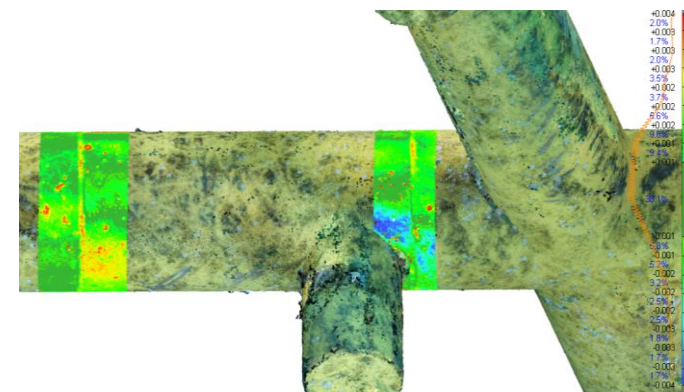
Jacket model #2

Background >

Two jackets required riser installations to connect the platforms via a new flowline. The jackets required 3D model of the clamp areas to determine diameter, ovality, weld dimensions, and locations of anodes.

Solution >

- Global models were created for each jacket to reference locations of measurements relative nodes.
- Detailed data analysis performed, including surface elevation heat maps to measure weld heights.
- Results confirmed several key measurements missing from original design records.



Weld seam measurement

Conclusion

- There's no “best technology” for all subsea imaging and metrology applications.
- SLAM and Photogrammetry tend to achieve requirements for most construction and IRM applications, and is easily operated by a variety of ROVs without involving complicated interfaces.
- ROV3Di combines SLAM and Photogrammetry into a single system that delivers the best of both technologies.
- Ashtead Technology offers full-service solutions including project management, offshore personnel, data processing and analysis.



