Speaker: Good morning everyone and thank you for coming to listen to our talk. Today I'd like to discuss our experience in working in and around the seabed over the last seven years and some of the techniques we've used to overcome the associated challenges, which predominantly relate to the seabed not staying where it belongs. My name is Richard, and I'm one of Viewport3's co-founders. These slides will be available after the expo, so if you'd like a copy, just let us know.

VIEWPORT3

OVERCOMING CHALLENGES: WORKING NEAR THE SEABED

SUBSEA EXPO '24

OVERCOMING CHALLENGES – WORKING NEAR THE SEABED

- What do Viewport3 do?
- Challenges in working near the seabed
- Examples from our portfolio
- Summary

Speaker: So we'll start off with a bit about ourselves, look at the challenges in working so closely to the seabed or its realm of influence, and then look at some examples before summarising the main points and releasing you back into the wild.

OVERCOMING CHALLENGES – WORKING NEAR THE SEABED

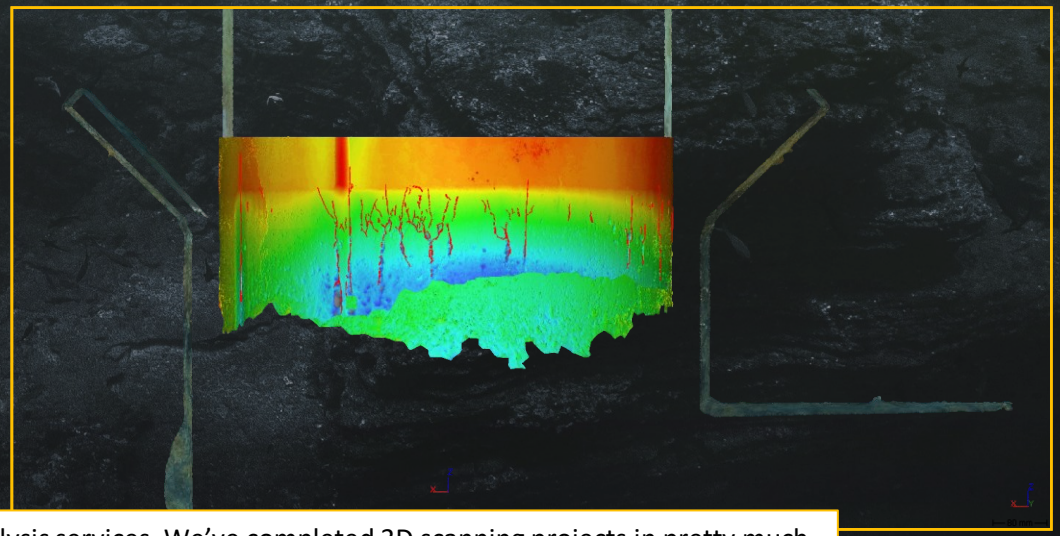
- What do Viewport3 do?
- Challenges in working near the seabed
- Examples from our portfolio
- Summary

Speaker: So, what do Viewport3 actually do?

VIEWPORT3

Viewport3 are providers of 3D Scanning and Dimensional Analysis services, most commonly for the Subsea sector, and predominantly for the Energy industry.

Subsea	(O&G / wind / archaeo / defence)
Topside	(onshore / offshore)
Aerial	(drone / rope-access)
Legacy	(3D data from existing footage)
Inshore	(quarry / reservoir / ports)



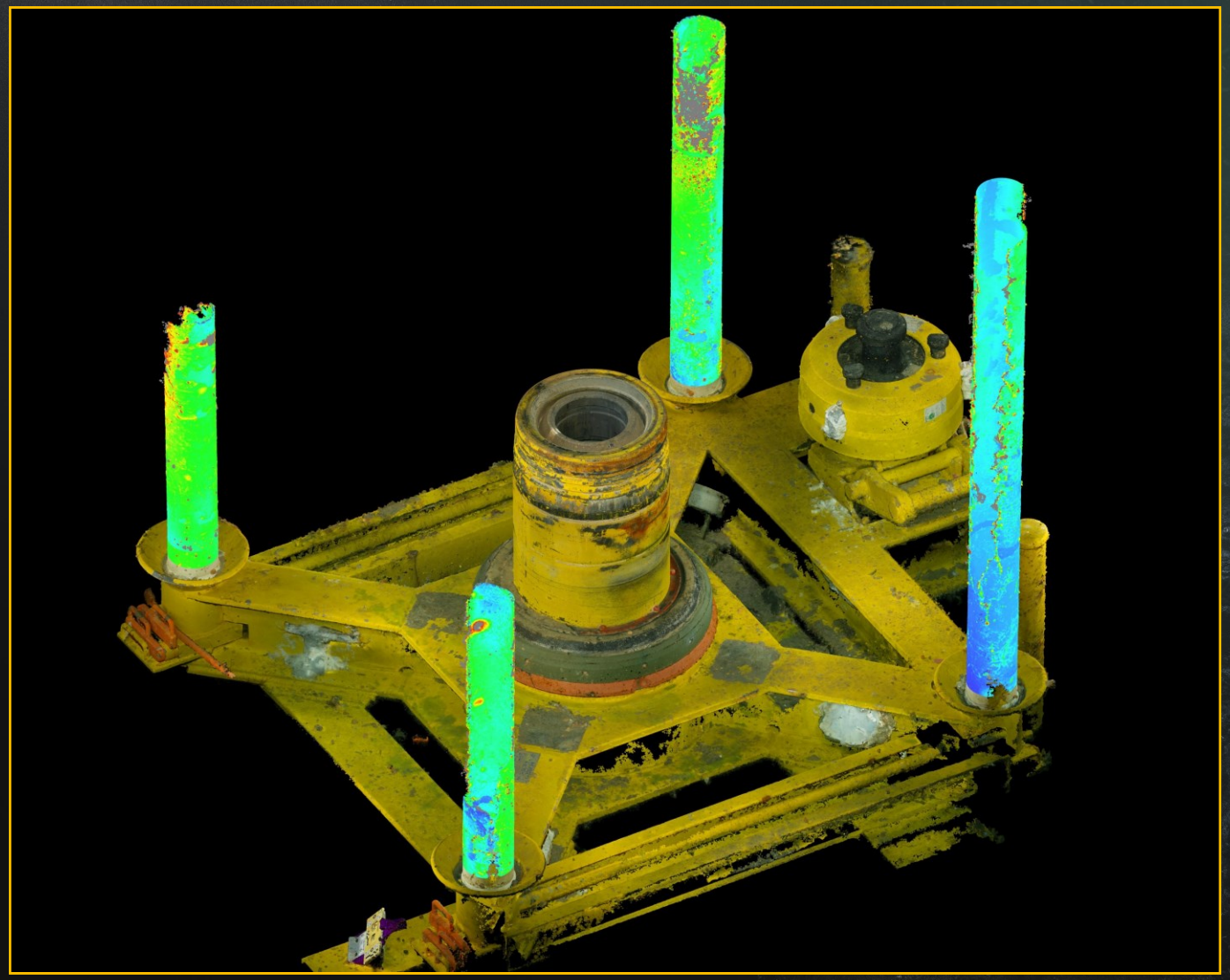
Speaker: As a wee bit of background, Viewport3 are providers of 3D scanning and dimensional analysis services. We've completed 3D scanning projects in pretty much every environment there is, or at least all the difficult ones, which are of course our favourites. We've even pulled information from dusty video archive cupboards and solved issues by reconstructing it into a measurable 3D shape. We love to solve problems and have also provided bespoke camera systems that allow capture in tight, awkward and hard to reach spaces. We work just as happily in Oil and Gas as we do in renewables, topsides, archaeology and defence.

Speaker: We're very proud to have helped a long list of returning customers, some of whom are detailed here. We are considered by Marine Contractors and Operators alike to be providers of full service 3D scanning analysis and reporting, which is aimed very squarely at answering the questions asked of us at project conception. These would include questions such as;

TRUSTED TO DELIVER

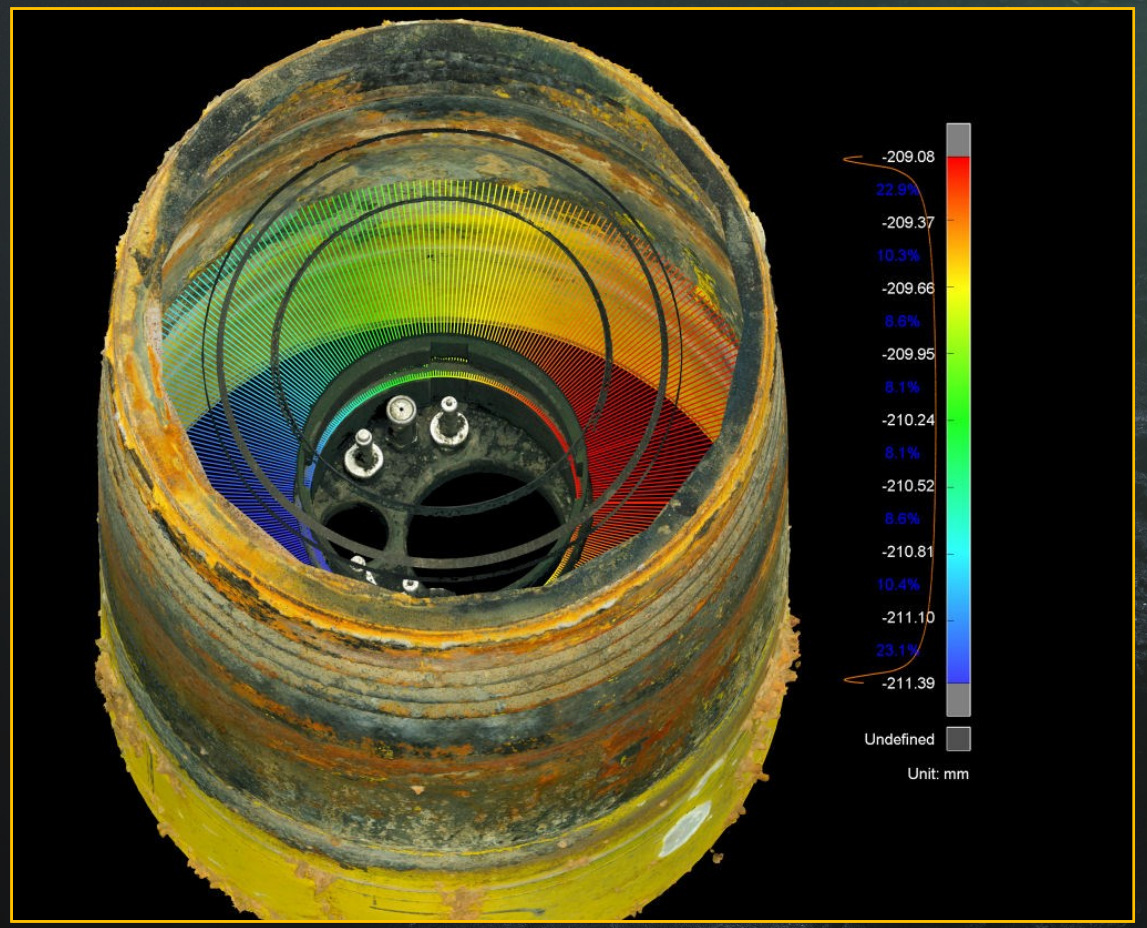
Speaker: Can you make an ‘as-is’ CAD version of our template so we can design a modification?

VIEWPORT3



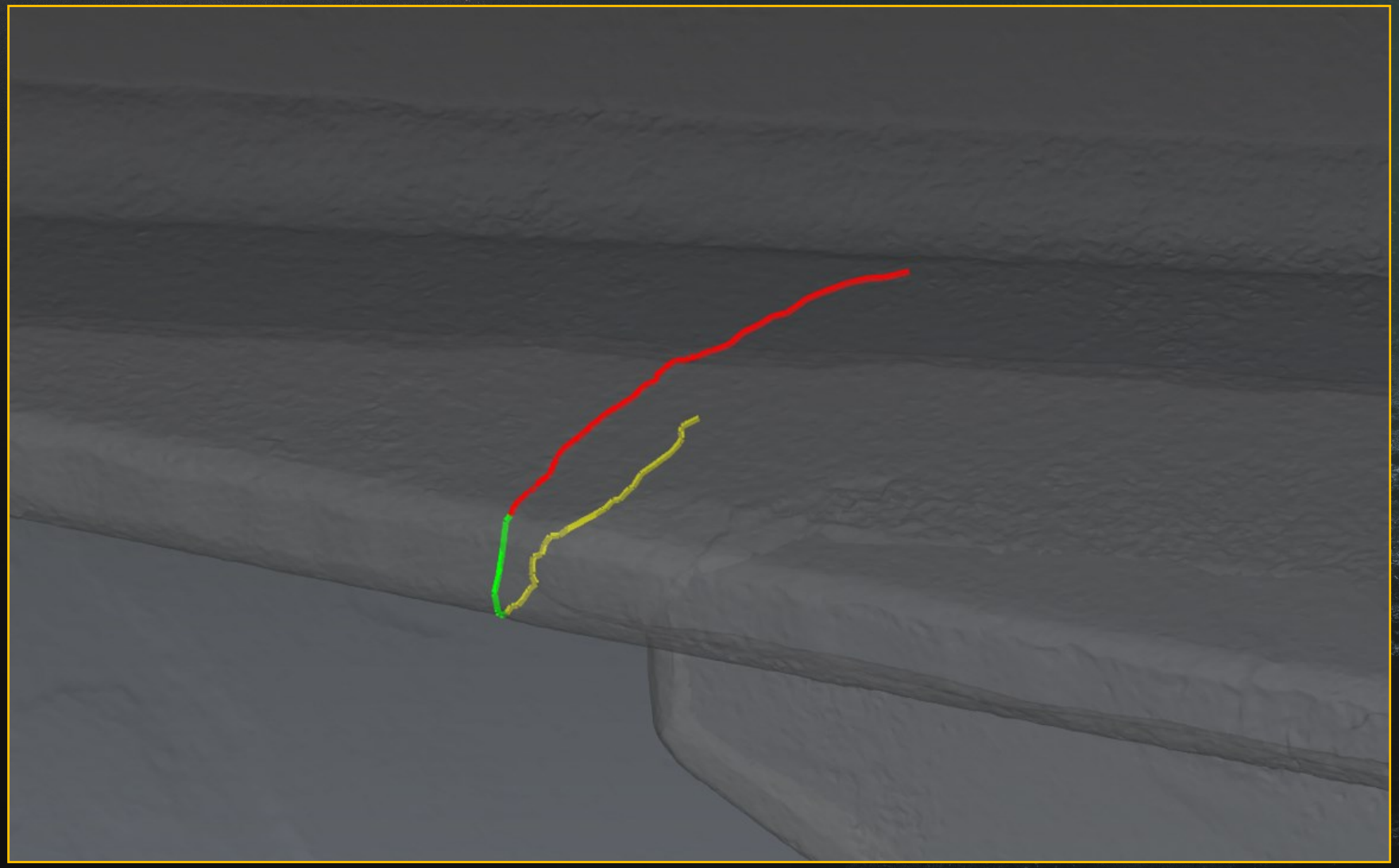
Speaker: How straight are my guide-posts?

VIEWPORT3



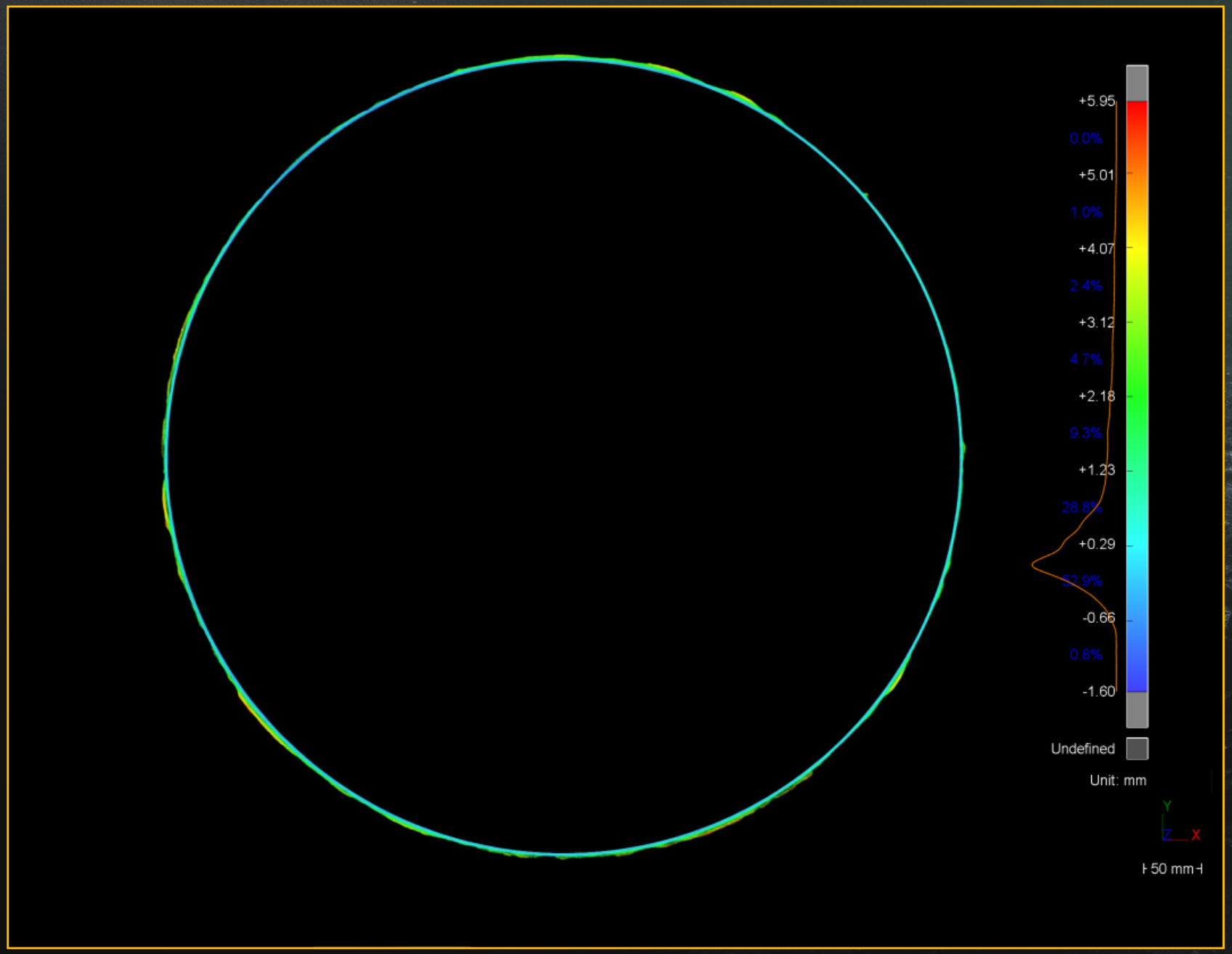
Speaker: Does my Tubing Hangar sit centrally within the wellhead?

VIEWPORT3



Speaker: Can you trace these cracks so we can plot their propagation?

VIEWPORT3



Speaker: And one of our most common queries – are the members I'm clamping my new riser to still circley?

VIEWPORT3

OVERCOMING CHALLENGES – WORKING NEAR THE SEABED

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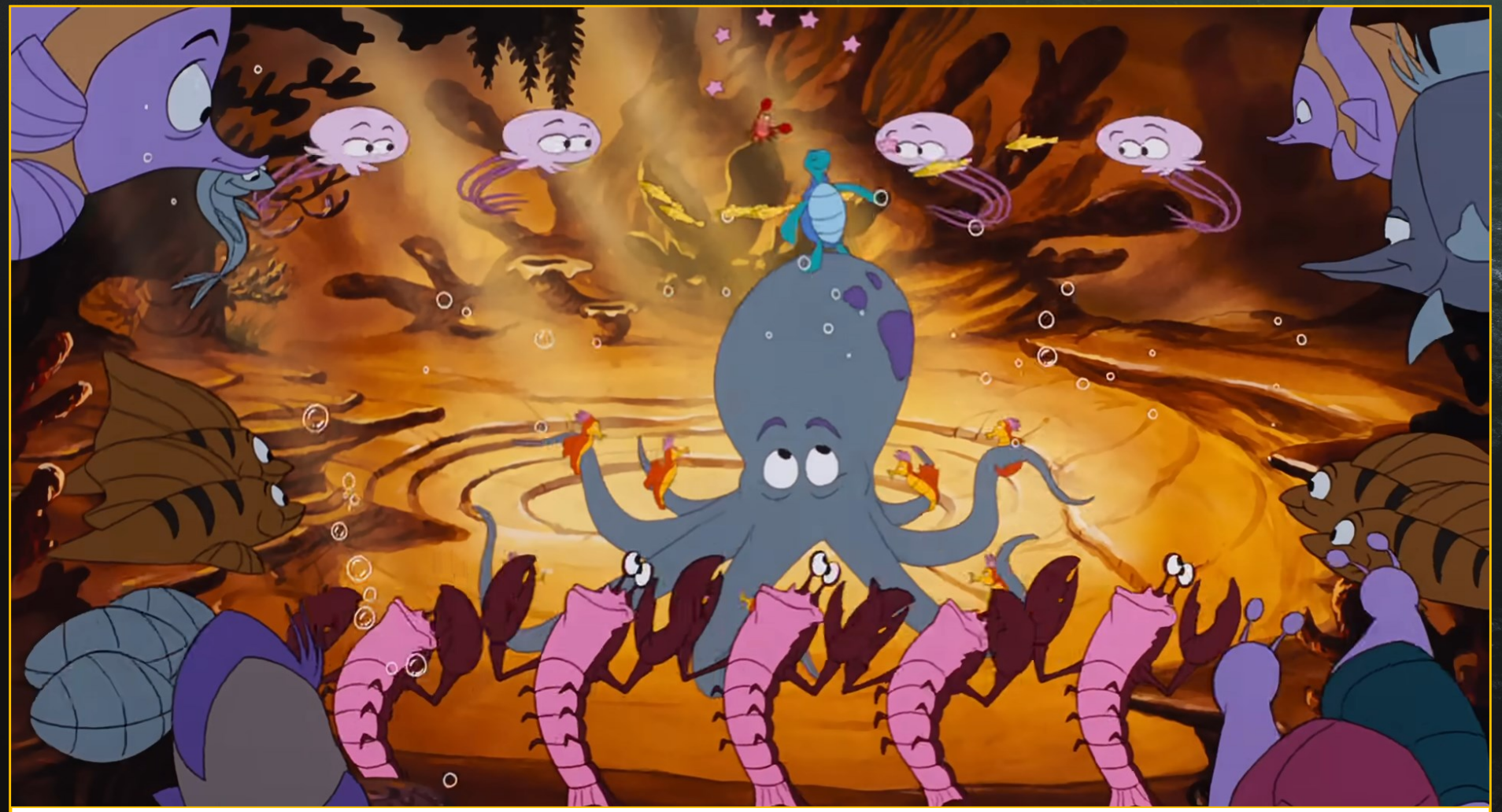
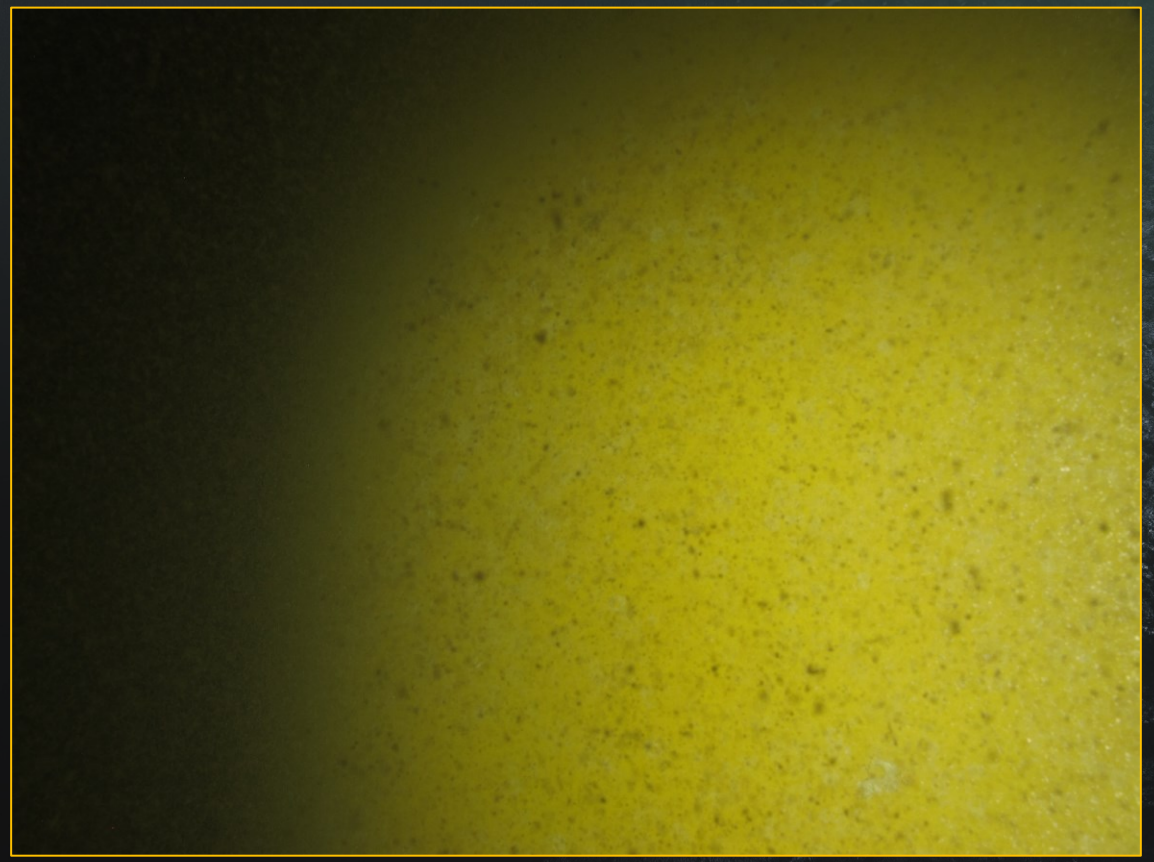
CHALLENGES IN WORKING NEAR THE SEABED



Speaker: As I’m sure we have all learned from this fine documentary about life under the sea, water clarity can be exceptional in some parts of the world.

CHALLENGES IN WORKING NEAR THE SEABED



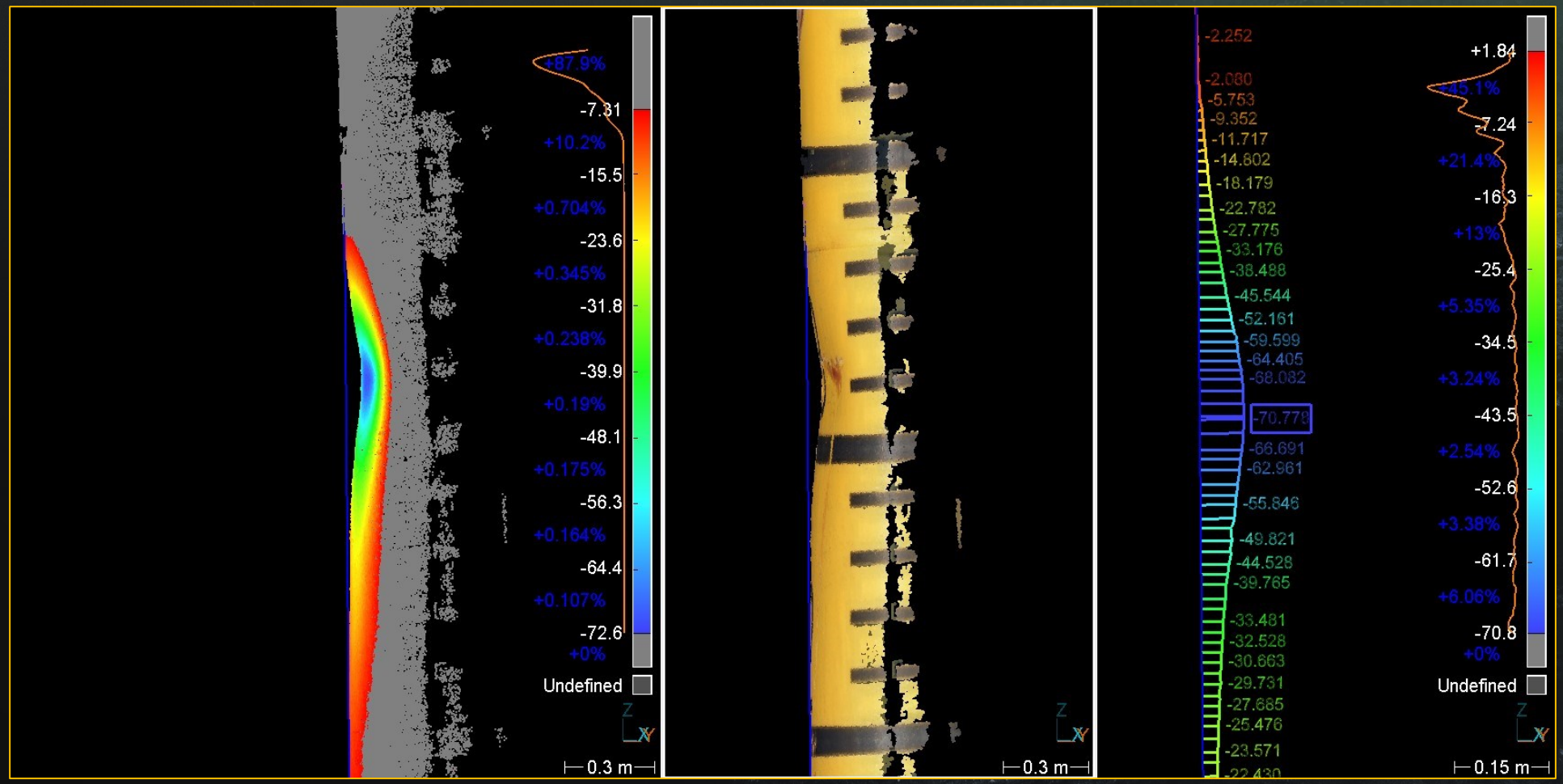
Speaker: Where we live however, it can be a challenge to see beyond a few inches. With little more than some trick lighting techniques, patience and proper planning, you can of course improve your view of the subject matter.

CHALLENGES IN WORKING NEAR THE SEABED

Speaker: This is of course, worst case scenario, where you are essentially reduced to taking images of opportunity whilst trying to keep-station next to the item you want to inspect. Does the client care about your visibility challenges? Of course not, they just want the high quality data you built your reputation on, so it's important you have all the tools and tricks in your pocket for when you need them.

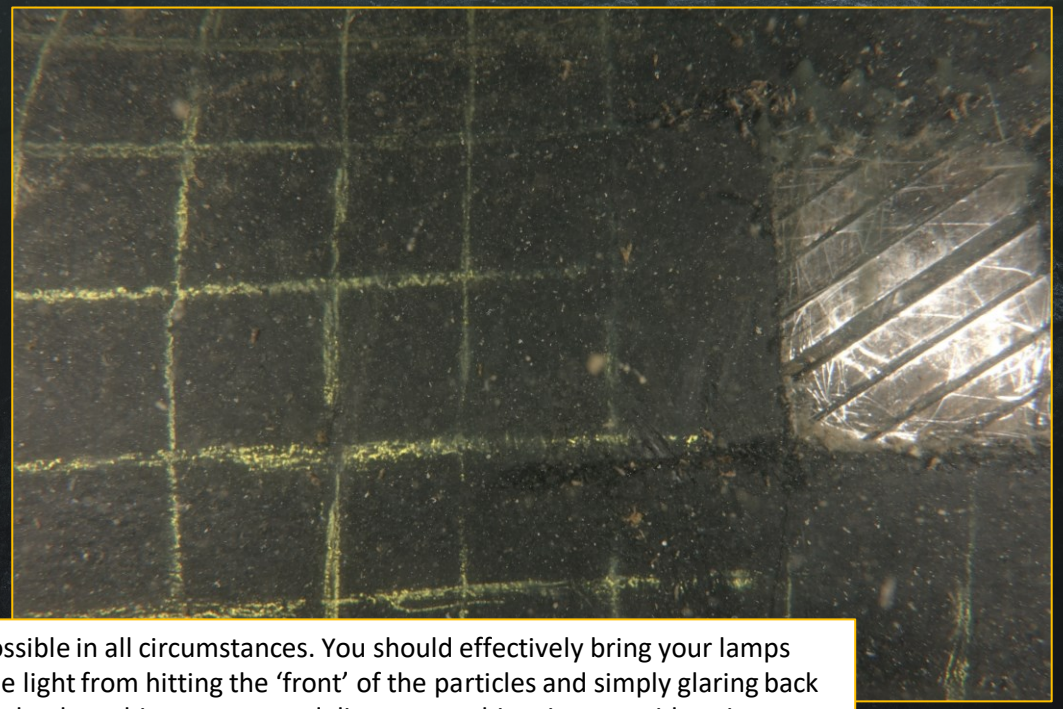
CHALLENGES IN WORKING NEAR THE SEABED

Speaker: And if you're patient enough, you will come away with the results the client requested. In this circumstance we were able to deliver a single 3D point cloud of a damaged leg which included data from both subsea and topside. Due to the millimetric nature of the final dataset, we were also able to show that most of the visible damage was paint-coat removal only, with the obvious exception of this dent profile.



CHALLENGES IN WORKING NEAR THE SEABED

Unless it's proper 'pea-soup' conditions, there are ways of overcoming turbid conditions. The below images were collected by a diver in atrocious visibility conditions, but image collection was enabled using back-scatter reduction photography techniques and by scribbling with a crayon.



Speaker: Reducing back-scatter is one of the most common mitigations, but is not possible in all circumstances. You should effectively bring your lamps forward and point them toward the centre of the scene. This will prevent much of the light from hitting the 'front' of the particles and simply glaring back at the camera's lens, removing most of the value from your image. We also have to take the subject matter and distance to object into consideration. You'll notice that the image is at its brightest at the edges, and that much of the particles have been successfully by-passed.

OVERCOMING CHALLENGES – WORKING NEAR THE SEABED

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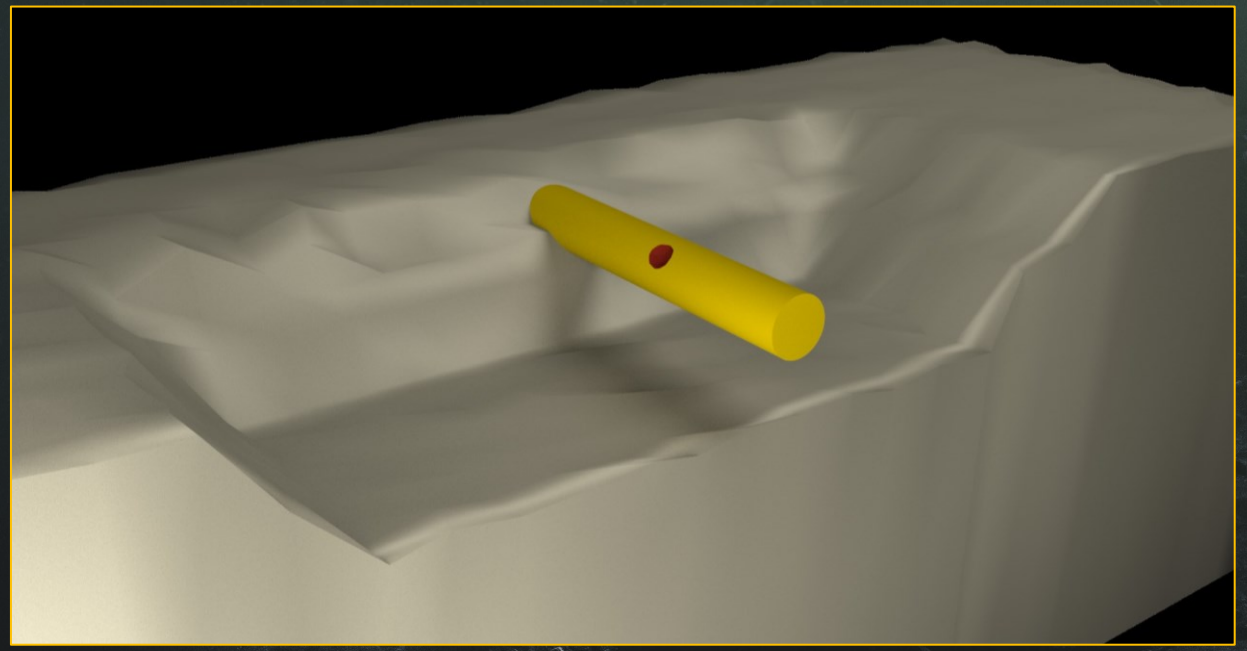
EXAMPLES FROM OUR PORTFOLIO

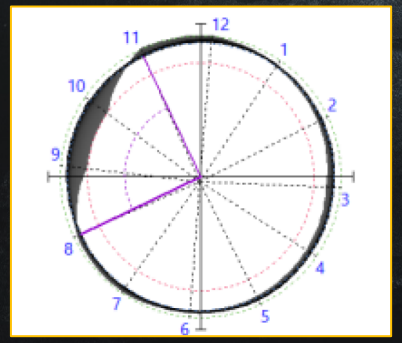
DAMAGED BURIED PIPELINE

In May of 2023, we were tasked with performing a 3D scan at the suspected site of a pipeline anomaly.

PIG inspection had already identified what appeared to be damage due to a striking object, and the operation wanted external confirmation of the damage.



SITE OVERVIEW



RAW PIG DATA

Speaker: Following reports from a PIG run that suggested a pipeline had reduced diameter, we were tasked with 3D scanning the outside of a buried pipeline. As if the shallow Dutch sector wasn't turbid enough, we had to excavate and release more sediment into the surrounding water column.

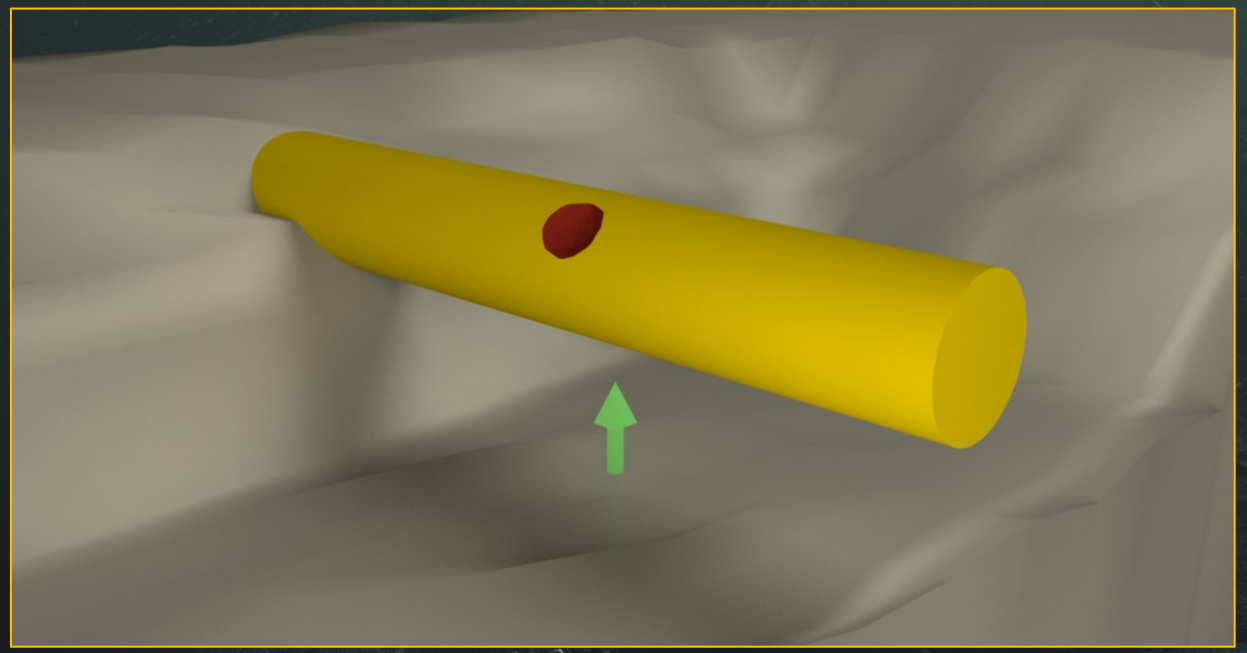
EXAMPLES FROM OUR PORTFOLIO

DAMAGED BURIED PIPELINE

The client requested that the full circumference of the pipeline be 3D scanned at the site of the damage.

This necessitated excavation to a depth that allowed a camera to capture data from directly underneath the pipeline.

Movement of the ROV or the bracket holding the camera, caused turbidity.



CAMERA POSITIONING DETAIL

Speaker: Considering that every movement of the ROV or the manipulator caused more silt, taking images from under the pipeline was something of a challenge. This was necessary due to the client's request to make ovality checks at stipulated distances from the impact area.

EXAMPLES FROM OUR PORTFOLIO

DAMAGED BURIED PIPELINE

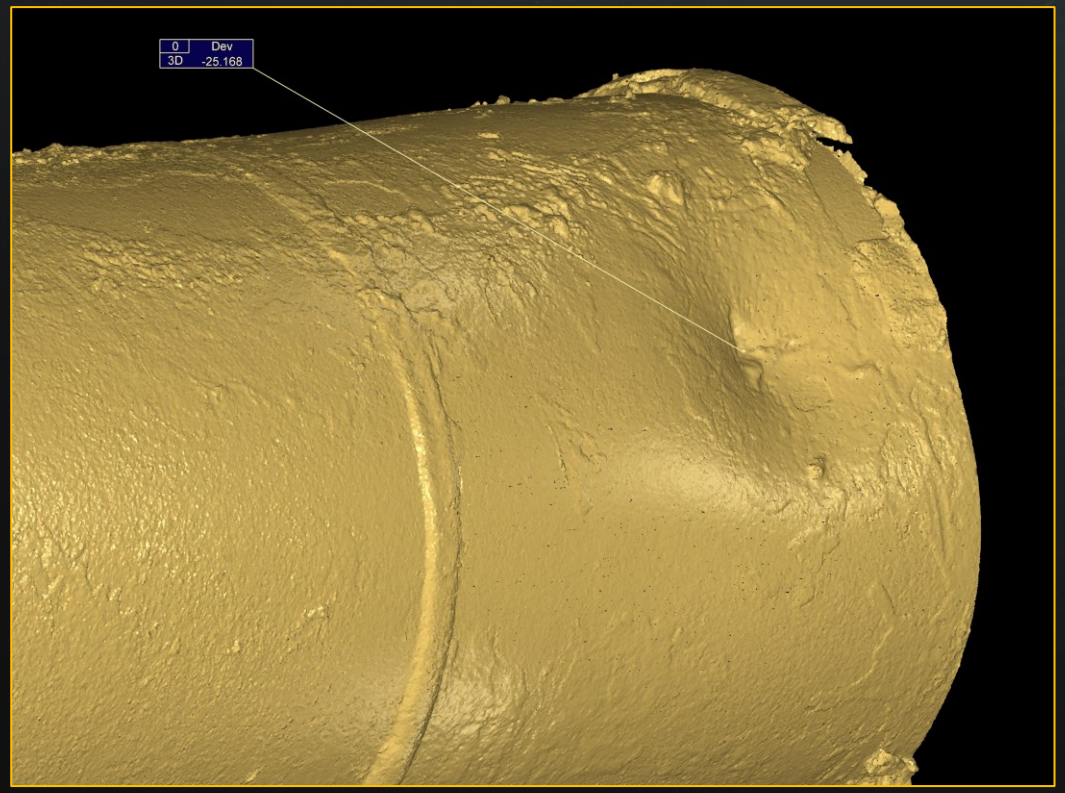
As we can see, the visibility at the site improved over time, and the capture was generally completed within specified tidal timings.

It took several attempts for the vessel to find the correct field-joint, but despite the delay, the client understood the need for patience in collecting high-end images, to provide the basis for a high-end 3D dataset.

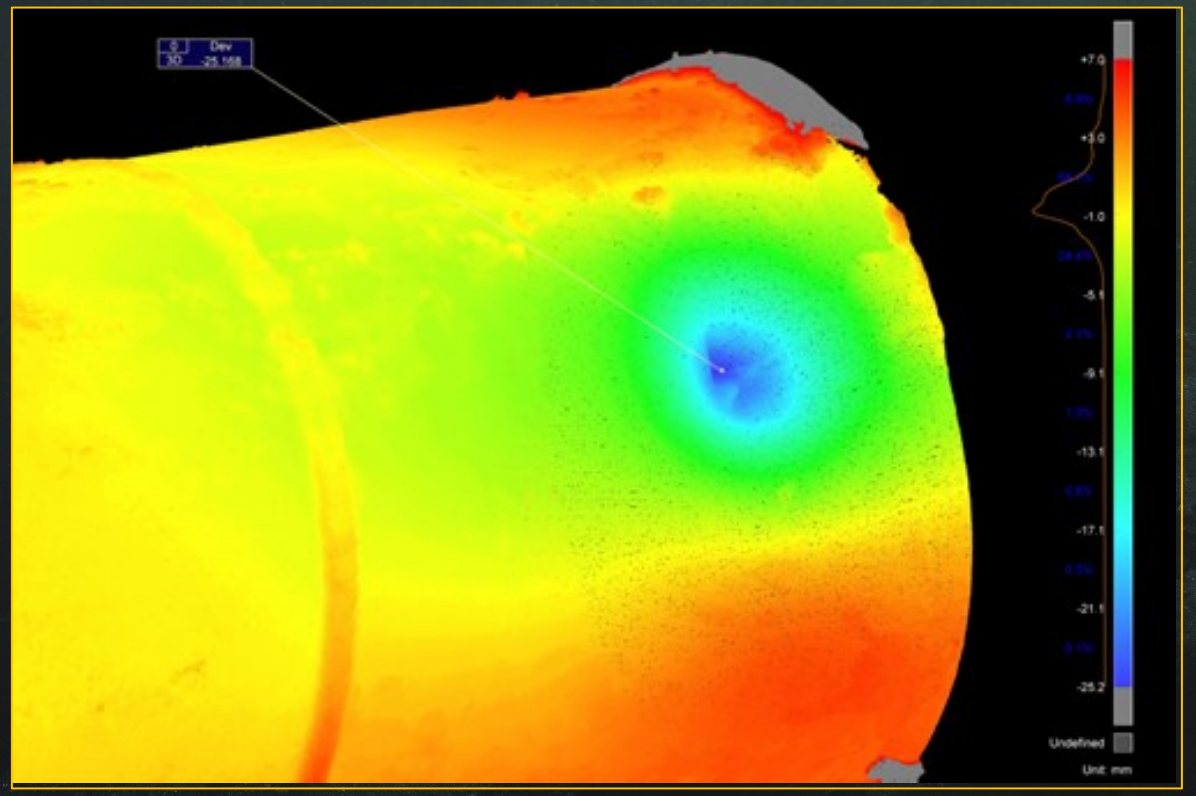
POST SEDIMENT SETTLING

Speaker: Whilst the visibility did gradually improve, it never got close to the stage of being ideal. We had advised the client of this challenge ahead of time so it didn't come as a surprise that the data collection was slower than usual.

EXAMPLES FROM OUR PORTFOLIO



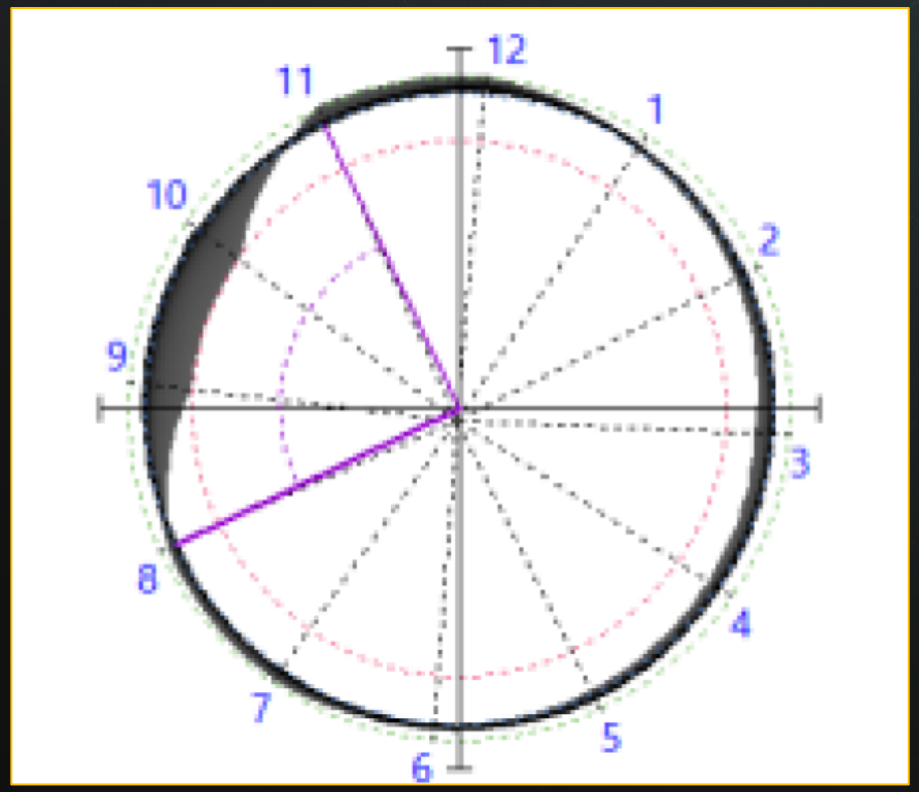
3D DATA RENDER WITH DEPTH CONFIRMATION



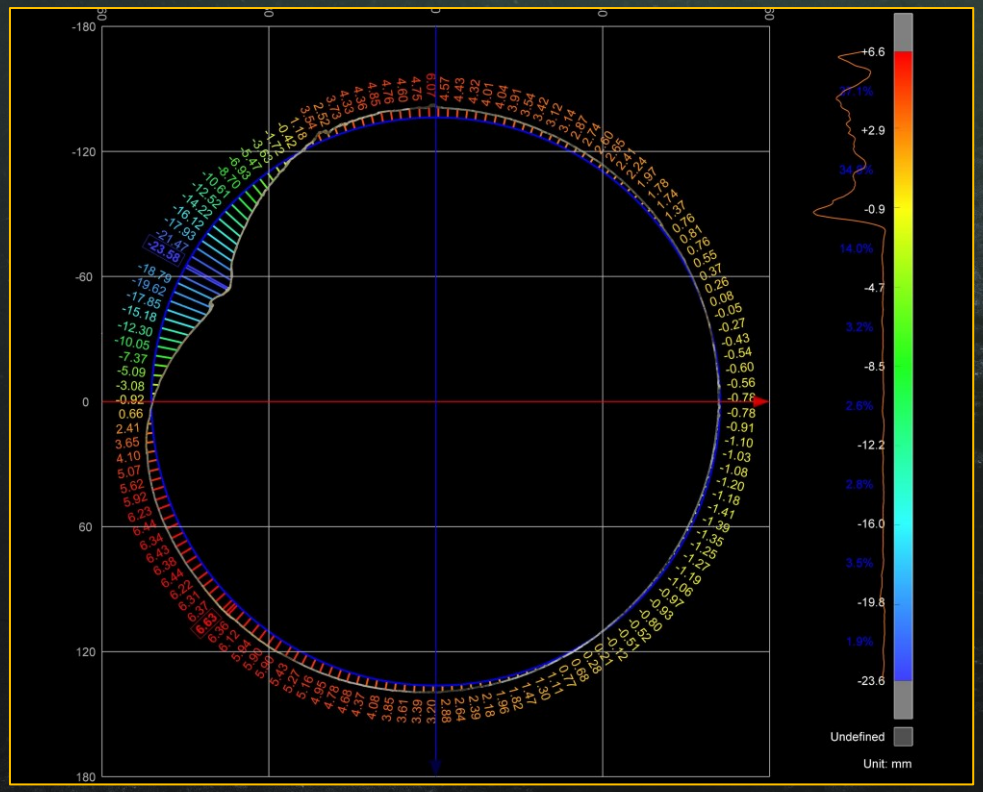
DEVIATION MAPPING AGAINST ORIGINAL SHAPE

Speaker: From our 3D data, it was clear that something has indeed struck the pipeline, and in accordance with Sod's Law, it struck an un-coated area at a field joint. There were no foreign objects in the immediate vicinity so the offending article remained a mystery.

EXAMPLES FROM OUR PORTFOLIO



PIG DATA



VIEWPORT3 DATA

Speaker: We were able to confirm however, that the PIG data was pretty much bang-on. We were further tasked with converting our data into the multi-finger and deflected distance format used by the PIG data supplier to allow them to import and manipulate our 3D data.

EXAMPLES FROM OUR PORTFOLIO

Speaker: A couple of years back we were tasked with assessing damage to a sub-station jacket which had been struck by a vessel in high sea states. Aside from damage to barriers etc, it was crucial that the damage to one of the legs be assessed as a priority.

DAMAGED SUB-STATION LEG

As a result of a request from a marine insurance company, a prominent marine contractor from the Dutch sector approached us following a collision between a vessel and a wind-farm jacket.

With the lift-barge on hire to install sub-station, assessing damage to the leg was critically urgent.

January 31, 2022, by Adnan Durakovic

A rudderless cargo ship is drifting around the Hollandse Kust Zuid offshore wind farm in the Dutch North Sea following a collision with an oil and chemicals tanker in heavy seas in the anchorage area near IJmuiden on Monday, 31 January, the Dutch Coastguard said.

NEWS REPORT

PLATFORM DAMAGE

EXAMPLES FROM OUR PORTFOLIO

Speaker: With the high currents and tidal forces stirring up the silty seabed, we could see essentially nothing to being with. With a lot patience however, and with some valuable advice from local partners on visibility windows, we were able to complete the task successfully.

DAMAGED SUB-STATION LEG

As many of you will know, visibility in the Dutch sector can be atrocious, with currents and tides picking up seabed sediment on an almost constant basis.

The Viewport3 team were very quickly reduced to taking ‘images of opportunity’ as we waited for ROV positioning and decent visibility to be aligned by the Gods of subsea inspection.

POOR VISIBILITY

IMAGE OF OPPORTUNITY

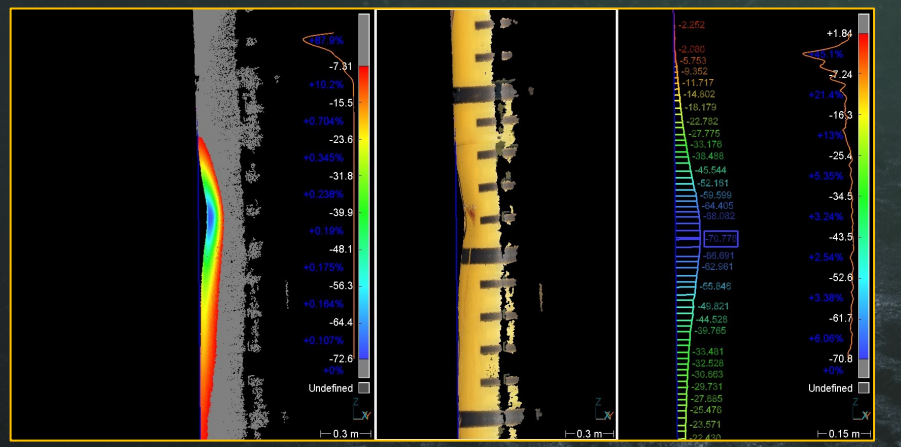
EXAMPLES FROM OUR PORTFOLIO

Speaker: This included collecting topside images from the vessel using a high-end DSLR camera, and by straddling the tide, creating a 3D dataset which reached from 2 or 3 metres underwater, up to around 15 metres above. As photogrammetry uses many images to create a dataset, we did in the end collect enough information to make an uncompromised 3D dataset, despite some images containing only a fraction of valuable data.

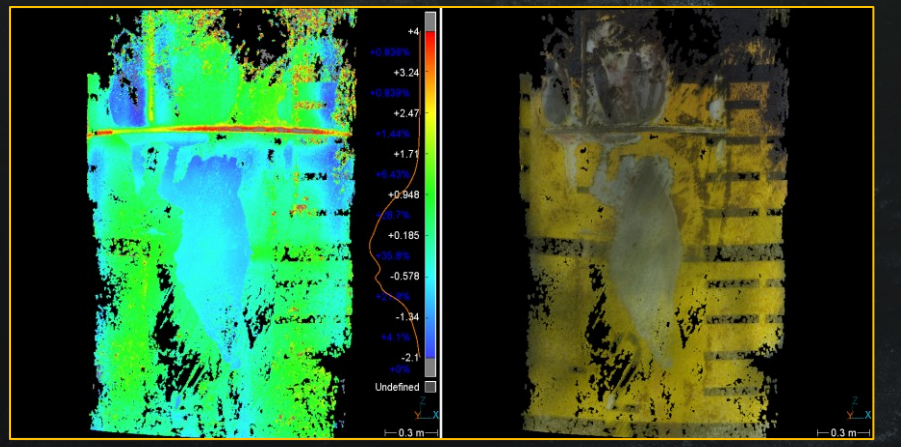
DAMAGED SUB-STATION LEG

One of the inherent benefits of photogrammetry is that we can model objects that cannot be viewed in a single image.

Whilst we can have 80% of pixels that are of no use, the process will use the valuable 20% from as many images as it has access to, and hence the 3D information is gradually built up.



3D ANALYSIS RESULTS



EXAMPLES FROM OUR PORTFOLIO

METH LINE REPAIR CLAMP

We were tasked by a returning customer with analysing data collected by an ROVs flight-camera, pertaining to a damaged methanol spool.

When offshore however, we must work with what we have available to us, so we got to work on their data.

CLIENT PROVIDED VIDEO DATA

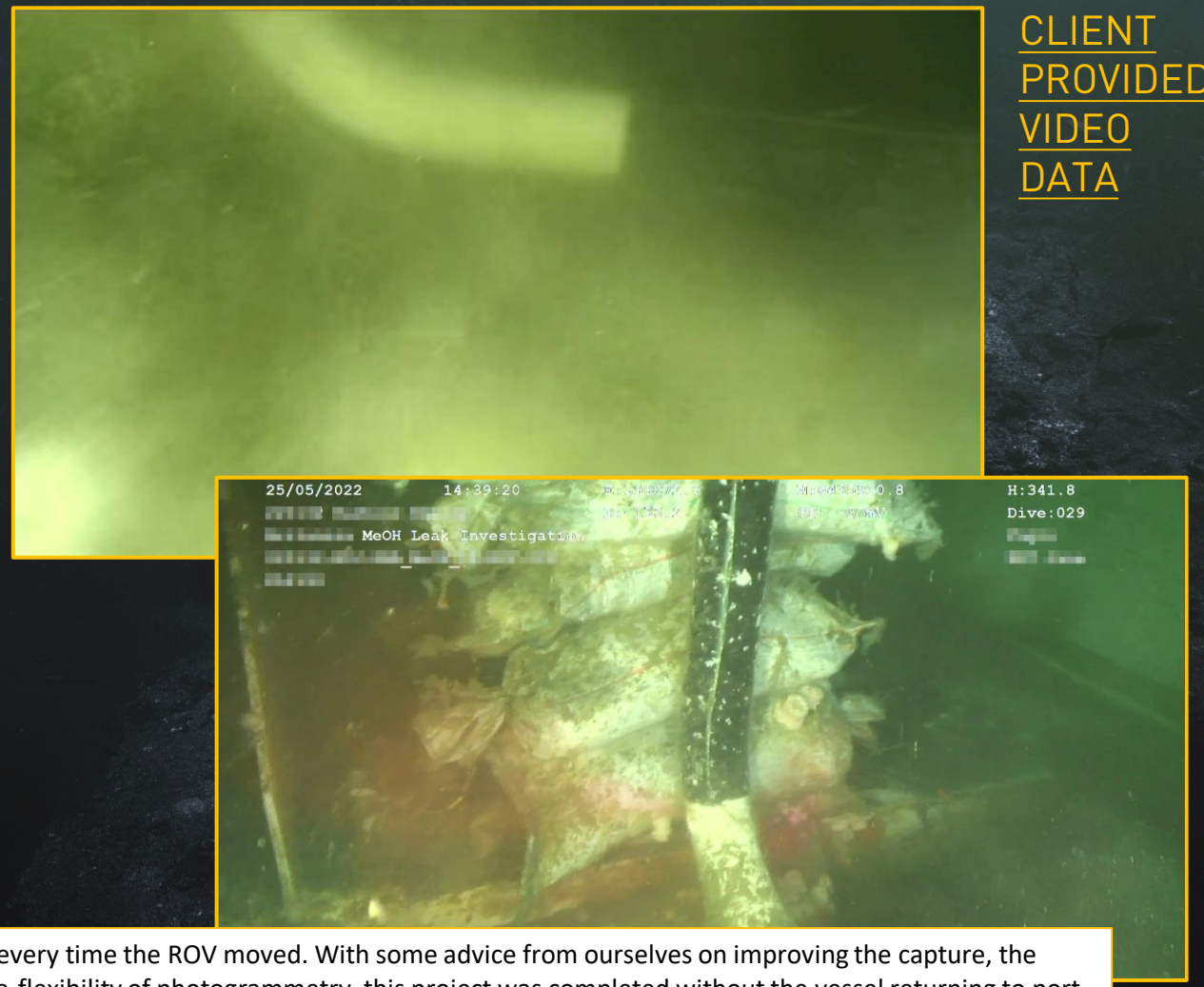
Speaker: In an emergency situation, we were tasked by one of our partners with providing a 3D version of a leaking methanol line. In case you can't tell, this image shows a meth line, some grout bags, and some pink tell-tale dye added by the platform.

EXAMPLES FROM OUR PORTFOLIO

METH LINE REPAIR CLAMP

With a repair clamp design in-hand, the client sought only to confirm the diameter of the line and the ‘actual’ angle of the bend.

The footage however, ranged from terrible, all the way to mediocre because the light, silty seabed kicked-up every time the ROV moved or dared to use its thrusters.



CLIENT PROVIDED VIDEO DATA

Speaker: The seabed in this area was as light and silty as we’ve seen, and kicked up every time the ROV moved. With some advice from ourselves on improving the capture, the client’s ROV team were able to collect better data 2nd time around. Showing the true-flexibility of photogrammetry, this project was completed without the vessel returning to port to collect people or equipment. We simply instructed them in techniques that would maximise the capability of the ROVs flightcamera and completed the work with what was available onboard at the time.

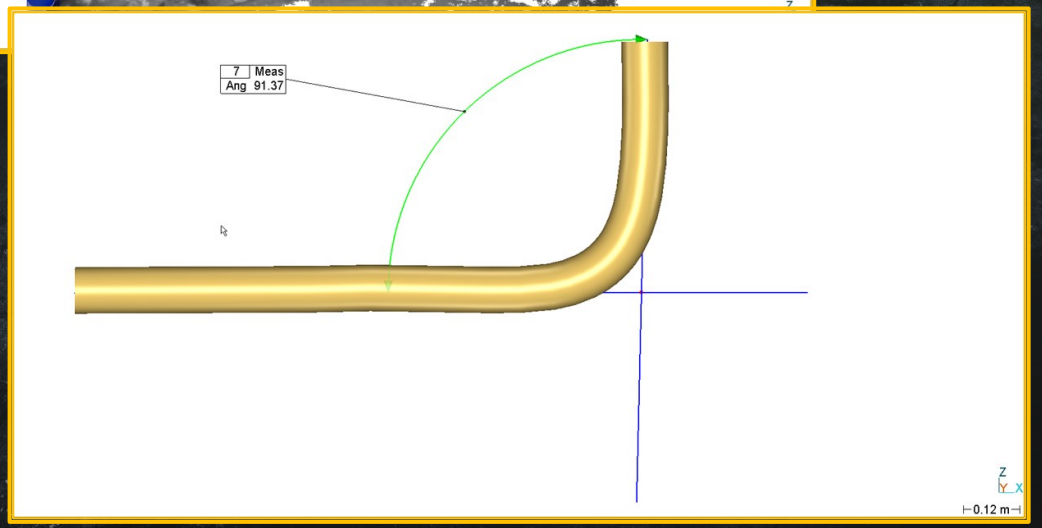
EXAMPLES FROM OUR PORTFOLIO

METH LINE REPAIR CLAMP

What we'd been asked to do however, was relatively straight-forward, and required only a few decent views of the subject matter.

We subsequently advised the client of the O/D, and confirmed that the bend had deviated from the original 90 degrees. The clamp was built to match our 3D data and fitted at the first time of asking.

3D RESULTS



Speaker: An ROV flight camera would of course be unsuitable for 90% of photogrammetry tasks, but our reporting requirements were pretty simple, so we cracked on with the work and the client achieved a first-time-fit soon after.

EXAMPLES FROM OUR PORTFOLIO

PERFORATED FLEXIBLE

Divers have an ability to alter their capture techniques in ways that are difficult to replicate by ROV, due to the diver's ability to alter the position of the light-source 'on-the-fly'.

Touching briefly on this task, we trained a Bluestream diver at our Aberdeen HQ for this task in the Dutch sector.

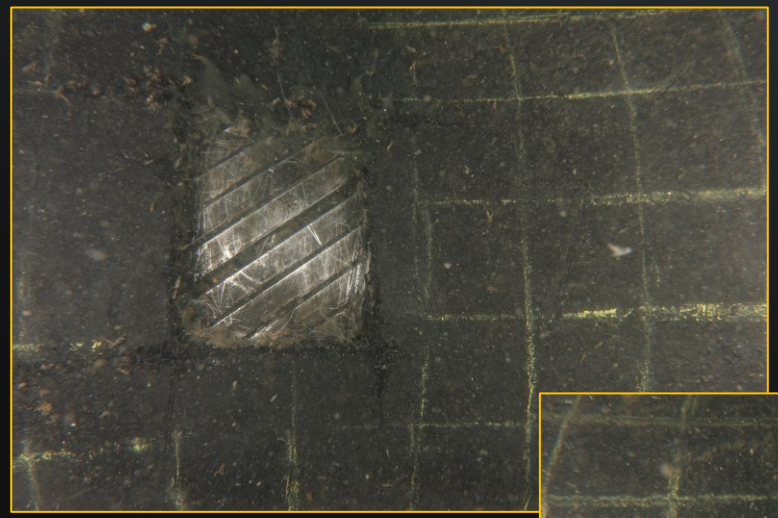
DIVER TRAINING

Speaker: When it comes to efficiency of capture in turbid conditions, there is no substitute for a well-trained diver, who can adjust camera settings and most importantly lighting angles to overcome challenging conditions. This fine gentleman came to us from Holland for a couple of days training and was taught the correct techniques in our state-of-the-art butchered IBC that we'd chucked some dirt into.

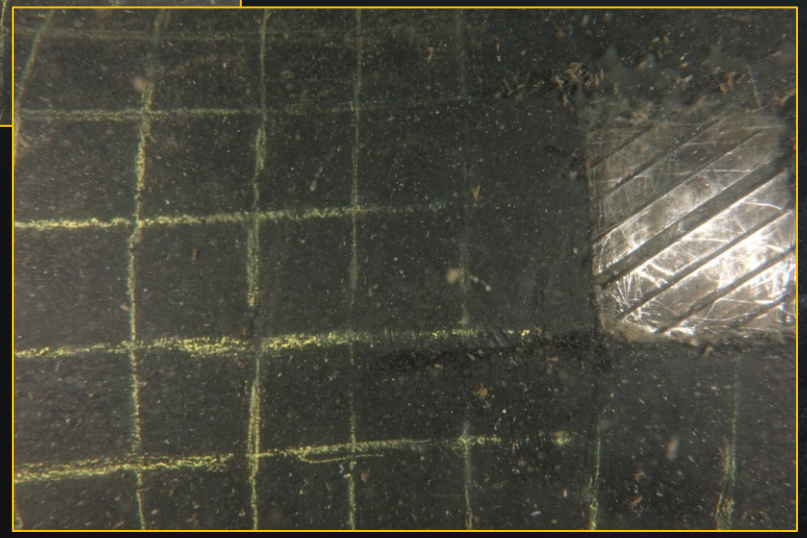
EXAMPLES FROM OUR PORTFOLIO

Speaker: The image on the right details the typical position of the lighting for such a challenging area, but even then they required slight adjustments during the shoot which the diver handled admirably.

PERFORATED FLEXIBLE



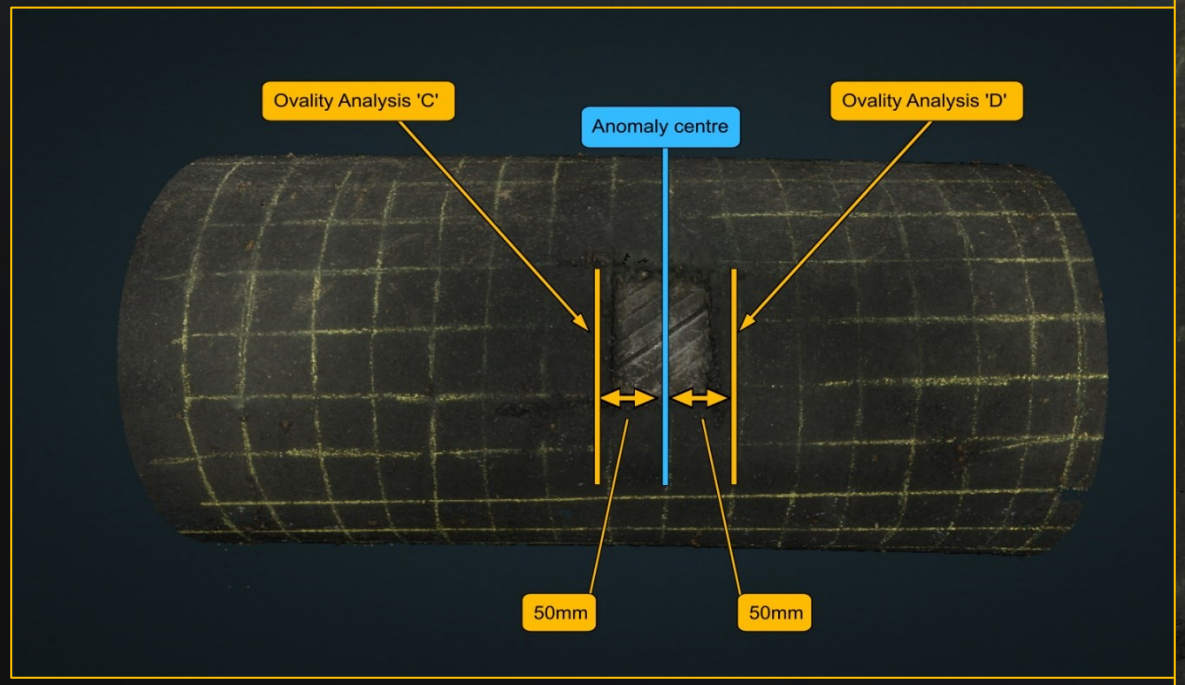
DIVER COLLECTED IMAGES



OBLIQUE ANGLE LIGHTING

EXAMPLES FROM OUR PORTFOLIO

PERFORATED FLEXIBLE



ANALYSIS RESULTS

Speaker: So once again, we have the data requested by the client despite the conditions. The application of crayon scribbles also helped the efficiency of the 3D reconstruction process.

OVERCOMING CHALLENGES – WORKING NEAR THE SEABED

- What do Viewport3 do?
- Challenges in working near the seabed
- Examples from our portfolio
- Summary

Speaker: So, to summarise

COMMON CHALLENGES

Seabed is silty & water is shallow

Seabed is silty and you've disturbed it with the ROV thrusters / diver movement

Marine growth has been cleaned and remains in the water column

An equipment basket landed next to your worksite

You excavated to reveal the subject matter and the silt is hanging around

COMMON CAUSES

Seabed is silty & water is shallow

- Wind-farms operators like shallow water, but currents and tides can cause zero-visibility

Seabed is silty and you've disturbed it with the ROV thrusters / diver movement

- Not always avoidable, but ROV operations can be planned to reduce this effect

Marine growth has been cleaned and remains in the water column

- Water jetting causes very localised turbulence which can affect visibility for hours

An equipment basket landed next to your worksite

- Any hardware that hits the seabed could affect visibility

You excavated to reveal the subject matter and the silt is hanging around

- Excavating to reveal a pipeline for example, can put tonnes of silt into the water column

COMMON MITIGATIONS

Seabed is silty & water is shallow

- Check tide schedule, try to work at slack tide and seek advice from local partners

Seabed is silty and you've disturbed it with the ROV thrusters / diver movement

- If this is known ahead of time, try to plan such operations long before / after inspections

Marine growth has been cleaned and remains in the water column

- Cleaning itself can also cause turbid conditions. Clean carefully if inspecting immediately

An equipment basket landed next to your worksite

- Try to plan other operations accordingly so the two don't hinder one another

You excavated to reveal the subject matter and the silt is hanging around

- Be aware of the potential delay in being able to see clearly

KIND WORDS FROM OUR CUSTOMERS

Subsea7

"The hardware **fitted first time** – client is really happy. Thank you".

Bluestream Offshore

"Viewport3 reacted quickly to our urgent request **and immediately gave us the right advice**. They rapidly prepared and transported the required equipment and personnel to the port, ready for deployment. Thanks to the **quality and accuracy of the 3D data supplied**, our end client was able to use it to approve continuation of the topsides installation".

BP

*"Viewport3 provided a quick and flexible attitude to their services, **saving BP time and money** for the inspection programme. The work scope was completed **on time and within the agreed budget**".*

ABOUT VIEWPORT3

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Thanks! ☺