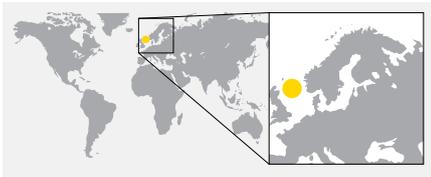


Accurate diagnosis

combining optical and ultrasound 3D imaging



Region: North Sea
Customer: Statoil
Well Type: Water Injector

Case Benefits

- Rapid confirmation and restoration of overall well integrity
- Detailed in-situ analysis of sub-assembly components, unobtainable by alternative diagnostic methods
- Saved rig time associated with milling SSSV's
- Diagnosis and remediation provided by specialist well integrity team

Key Capabilities

- High resolution forward and side view optical technology
- Real-time information from e-line conveyed services
- Millimetre accuracy ultrasound measurements obtained in three dimensions
- Full 360° coverage of wellbore circumference

Case study: **SPACE® Panorama and optical camera**

Combined optical and ultrasound 3D imaging delivers accurate diagnosis enabling rapid remediation of sub-surface safety valve

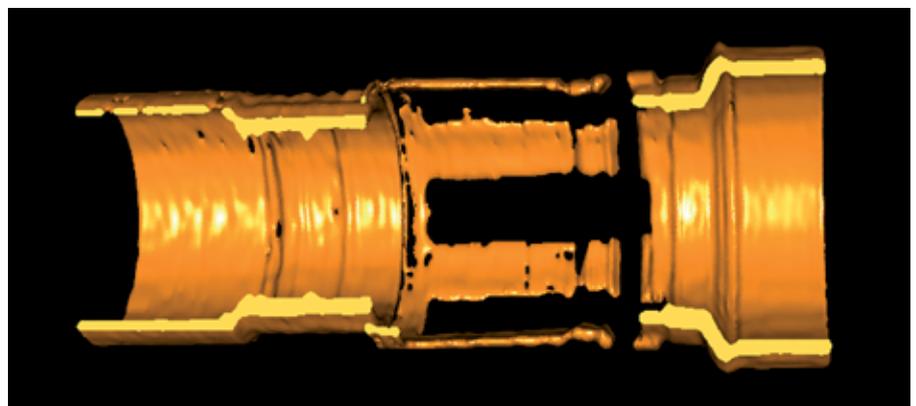
Challenge

Statoil began a suspension programme on a water injection well of a major oil producing field in the North Sea. Due to its narrow diameter, the sub surface safety valve (SSSV) at 268 m had to be pulled in order to allow a deep set suspension plug to be placed in the lower completion. During the intervention, the wireline crew were unable to latch onto the SSSV with the pulling tool, preventing the suspension and presenting Statoil with a challenging decision on how to ensure the long-term integrity of the well.



Solution

In order to assess the downhole conditions and rule out any major structural issues, an optical camera was deployed. This was readily available and was run in the well by the same multi-skilled Archer wireline crew already on board. The high resolution images from the combined forward and side viewing optical camera revealed that the valve was intact and confirmed overall well integrity. To determine why retrieval was unsuccessful, a **SPACE® Panorama** 3D ultrasound imaging survey was carried out to provide precise measurements of the SSSV assembly. The measurements



3-D rendering of **SPACE® Panorama** data
 Image shows longitudinal section view of sleeve located within the SSSV assembly.

Case study: **SPACE® Panorama and optical camera**

obtained, analysed in conjunction with the SSSV manufacturing information, revealed that the latch mechanism was in an incorrect position, having been offset downwards by 0.6 inches from its design specification. This decreased the minimum internal diameter (ID) of the section from 3.58 inches to 3.36 inches. The reduction in minimum ID fully explained why the 3.53 inches outside diameter (OD) pulling tool had been

prevented from passing through the restriction.

Results

Utilizing the precise information supplied by the **SPACE® Panorama** survey, Archer were able to make exact modifications to the pulling tool, allowing it to latch on to the affected insert sleeve. The modified tool successfully removed the SSSV on the first attempt.

Typical applications:

Production enhancement

Enable the scheduling and execution of activities to enhance production:

- Clean-up of wellbore restrictions and blockages
- Stimulation of perforations, screens and inflow control devices

Safety & integrity

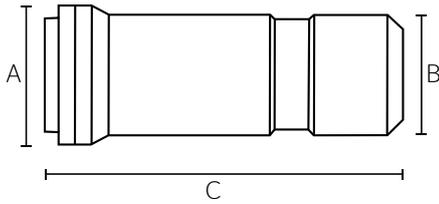
Enable compliance with local or international regulations for health safety and the environment:

- Safety valves, blowout preventers, wellheads and trees
- Structural performance limits of tubings, casings and liners

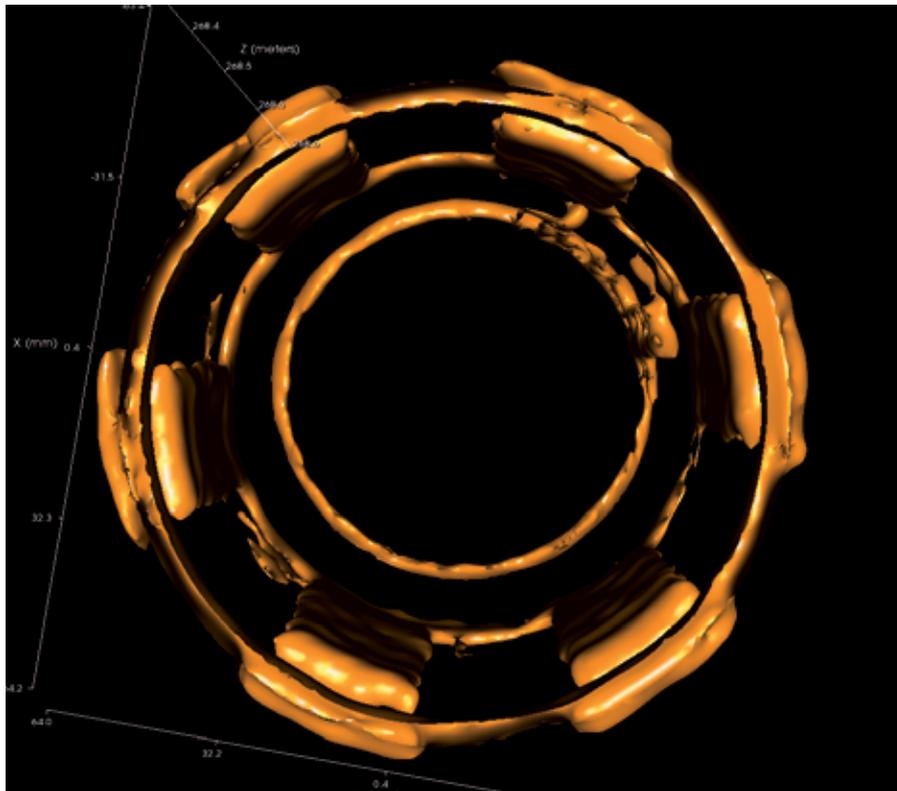
Remediation

Obtain precise dimensions of downhole geometries to maximise success of remedial actions:

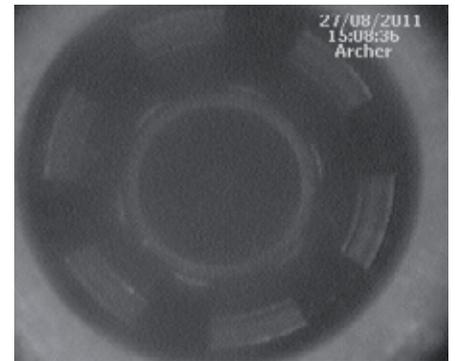
- Setting of straddles, patches, plugs or packers
- Fishing



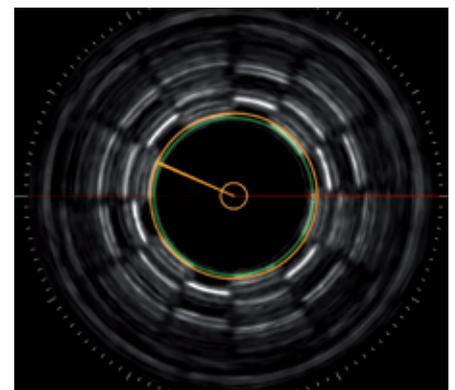
Schematic of pulling tool, dimensions below.
A: 4.155 in B: 3.532 in C: 12.062 in



3-D rendering of **SPACE® Panorama** data.
Image shows top-down view of plunger located within the SSSV assembly.



Non quantitative data from industry leading camera.



Real-time Image and measurements from **SPACE® Panorama** Survey. Green circle indicates the minimum ID of the fingers - 3.36 in. Orange circle indicates the OD of the pulling tool - 3.53 in



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