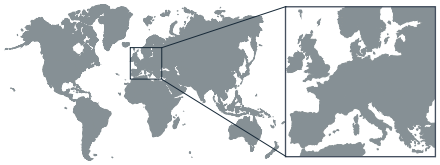
Landing nipple investigation

Complex geometry accurately measured

Case study: **SPACE® Vernier**

3-Dimensional evaluation of a nipple profile was needed to verify the correct installation of a Landing Nipple Safety Valve. Accurate circumferential measurements allowed confidence that a standard lock mandrel could safely be used.



Region: Europe
Well Type: Producer

Case Benefits
- Precise measurement of nipple profile under downhole conditions
- Confidence in measurements, even in sharp changes of ID
- Verification pass after mechanical brushing gives confirms the measurements are of the nipple and not of deposits
- Dimensional accuaracy allowed standard lock-mandrels to be used with confidence.

Key Capabilities
- Real-time information from e-line conveyed services
- Full 360° coverage of internal profile
- Millimetre accuracy ultrasound measurements obtained in three dimensions
- Speed of sound sensor ensures real-time ID calibration
- 3D rendering to aid understanding available immediately on wellsite

Typical Applications
- Casing internal and external diameter evalaution
- Measurement of internal dimensions of complex completion items

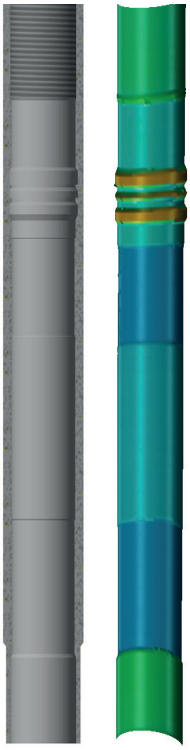
Challenge

Erosion under conditions of high CO_2 partial pressures and free water at high temperatures can affect even corrosion-resistant alloy components. In the case of a landing nipple safety valve installation, dimensional confidence is vital to ensure functional compliance.

The precise dimensions and condition of the internal profile of a nipple cannot be directly measured using conventional downhole techniques, but accurate measurements are needed to confirm that a lock mandrel will safely engage and not be ejected from the well.

Solution

The non-contact ultrasonic array of the **SPACE® Vernier** was chosen for this critical intervention because the directed beam is able to fully measure the intricate profile of the landing nipple interior, unlike a mechanical caliper finger that is unable to measure sharp shoulders of downwards facing edges.
A laboratory test was conducted to confirm the tools capability, and with a reading every 1 ¼ degrees circumferentially, **SPACE® Vernier** high resolution data ensured complete evalaution of all internal surfaces.



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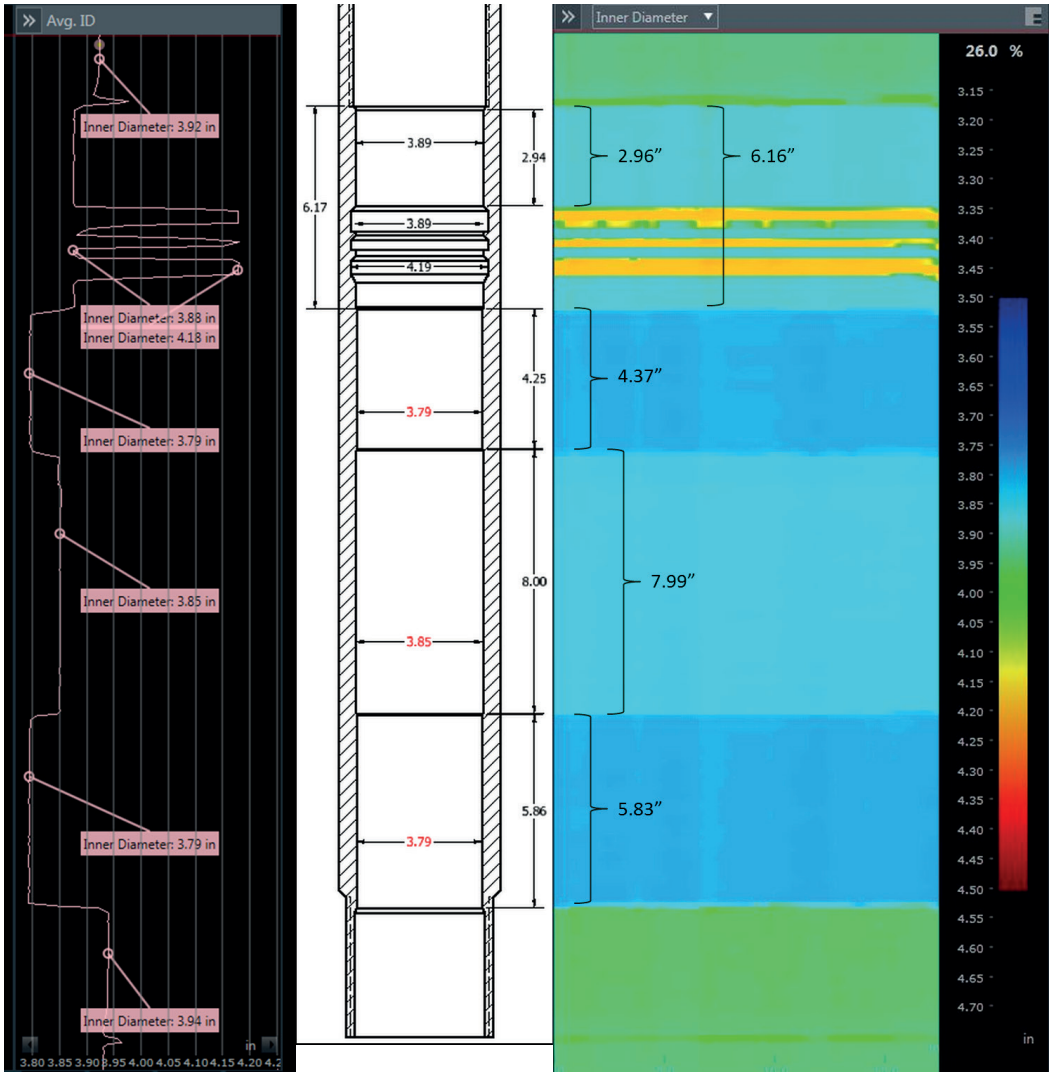
Result

Multiple passes confirmed excellent repeatability and data quality. No stick/slip effect was in evidence as the tool passed the nipple profile.

Only a copy of a hand-drawn schematic was available for reference, from which a profile was reconstructed. All dimensions corresponded with the expected values, both in diameter and length.

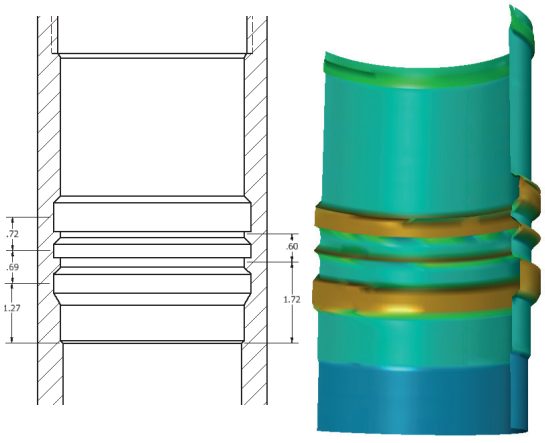
After the nipple assembly was mechanically brushed, the log was re-run and the dimensions were identical, showing that the readings were actual physical dimensions and not affected by the buildup of any deposits.



Average ID plot, reconstructed schematic and internal diameter flat 2D display over the nipple assembly.

The lock profile was examined in detail to evalaute any discrepancies that would prevent a standard lock mandrel from engaging correctly, and all dimensions were found to be correct.

SPACE® Vernier confirmed critical dimenisons in a landing nipple, allowing a standard safety valve to be installed with confidence.



Lock profile in 3D alongside the schematic with dimensions.

Captured by SPACE®

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