

Case study Multi Tube Integrity

Through-barrier tube diagnostics provides reliable low-cost solution to inspect surface casing condition



Location: Abu Dhabi, UAE
Well type: Oil producer
Reference: SPE 188258

Case benefits

- Detected corrosion in 13½-in. surface casing through 3½-in. production tubing and 9½-in. production casing.
- Identified severe corrosion that would have been missed by conventional excavation and visual inspection procedure.
- Showed how the Multi Tube Integrity product complements existing excavation and inspection methods to deliver improvements in the health, safety and environment domain.

Challenge

Corrosion of surface casing in onshore wells is a common problem throughout the Arabian Peninsula, so operators must periodically excavate around wellheads to inspect external casing. Though costly and time-consuming, this was until recently the only way to establish the competence of the surface casing, paramount for safe operations.

Until recently, diagnostic tools run through tubing have been able to evaluate the production casing but not the surface casing. Evaluating surface casing in this way required a workover. The operator of an onshore well wanted to assess the effectiveness of a new diagnostic system to evaluate the integrity of tubing, production casing and surface casing in a single survey,

without the disruption of conventional methods.

Solution

TGT has developed the 'Multi Tube Integrity' product as a cost-effective and efficient way to measure metal loss across multiple well barriers.

The Multi Tube Integrity product is delivered by TGT's 'True Integrity' diagnostic system that chiefly uses the Pulse technology platform to evaluate the wall thickness of multiple barriers.

Pulse combines advanced electromagnetic sensing and measurement technology with powerful modeling and analysis capabilities. Pulse features multiple coil sensors, each

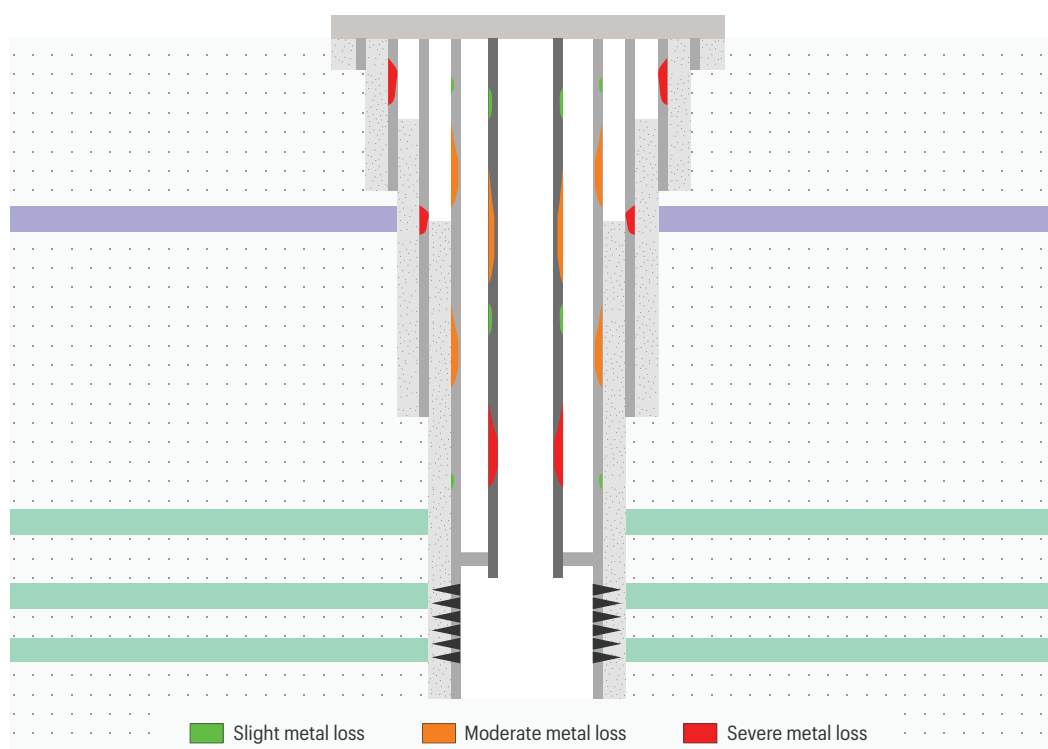


Multi Tube Integrity example well sketch.

Multi Tube provides an accurate barrier-by-barrier assessment of up to four concentric tubulars from a single through-tubing deployment.

Powered by our True Integrity system and Pulse technology, Multi Tube is the industry's most accurate multi barrier diagnostic product.

Multi Tube is used routinely to support your ongoing integrity management programme, or in a targeted fashion to investigate a specific integrity breach. Our ability to assess up to four concentric tubulars simultaneously means that most of the well can be evaluated in a single deployment, without pulling the tubing.



optimised by length and geometry to engage with a particular tube size. This enables it to assess the electromagnetic signature of each tube and so establish wall thickness variations. The minimum metal thickness loss levels that the Pulse platform can identify are a 3.5% reduction in production tubing, 6% in production casing and 12% in surface casing.

Result

Pulse analysis identified two zones of severe corrosion in the test well's surface casing (Figure 1). Metal loss was estimated at 44% in the upper zone and 38% in the lower zone.

Subsequent excavation revealed severe corrosion equivalent to a 50% metal loss that confirmed the Pulse result. Following normal procedure, the excavation would have

stopped at 12 ft depth and the inspection team would not have observed the second zone of corrosion.

Validation of the Multi Tube Integrity method for three-barrier corrosion assessment has had a positive impact on the operator's well integrity processes and identified a gap in existing procedures for surface casing inspection.

The success of this trial provides further options for proactive well integrity management and has the potential to reduce total costs and deliver improvements in the health, safety and environment domain. In the future, Pulse will be incorporated into the operator's routine inspection strategy. This is expected to deliver substantial technical and business benefits.

True Integrity diagnostics using the Pulse platform identified severe corrosion damage in the 13 $\frac{3}{8}$ -in. casing [44% metal loss] in an area 5–8 ft from the tubing hanger and another area of significant corrosion at 20 ft. The lower section with 38% metal loss was missed by the conventional excavation procedure. The 18 $\frac{1}{2}$ -in. conductor was not quantified in this case, but the discovery of severe corrosion in the 13 $\frac{3}{8}$ -in. casing suggested there would be external corrosion on the conductor that was in contact with the water-bearing formation.

