

Case study Multi Seal Integrity

New acoustic array platform finds elusive low-rate leak source in active well



Location: The Netherlands
Customer: Nederlandse Aardolie Maatschappij (NAM)

Case benefits

- Identified the precise depth of the leak point
- Improved certainty and confidence in diagnosis, indicating source of flow was near wellbore and not in the reservoir
- Comparison of acoustic technology showing that ChorusX provides a more detailed, precise and informative diagnosis
- Enabled the operator to target precise remediation, and to bring the well back into safe operation

Multi Seal Integrity example well.

Multi Seal Integrity evaluates the seal performance of multiple barriers, locating leaks and flowpaths throughout the well system, from the wellbore to the outer annuli.

Delivered by our True Integrity system with Chorus, Indigo and Maxim technology, Multi Seal provides a clear diagnosis of leaks and rogue flow paths so the right corrective action can be taken.

Multi Seal is used in a targeted fashion to investigate a known integrity breach anywhere in the well system. Barriers can also be validated proactively to confirm integrity. Either way, Multi Seal provides the insights needed to restore or maintain a secure well.

Challenge

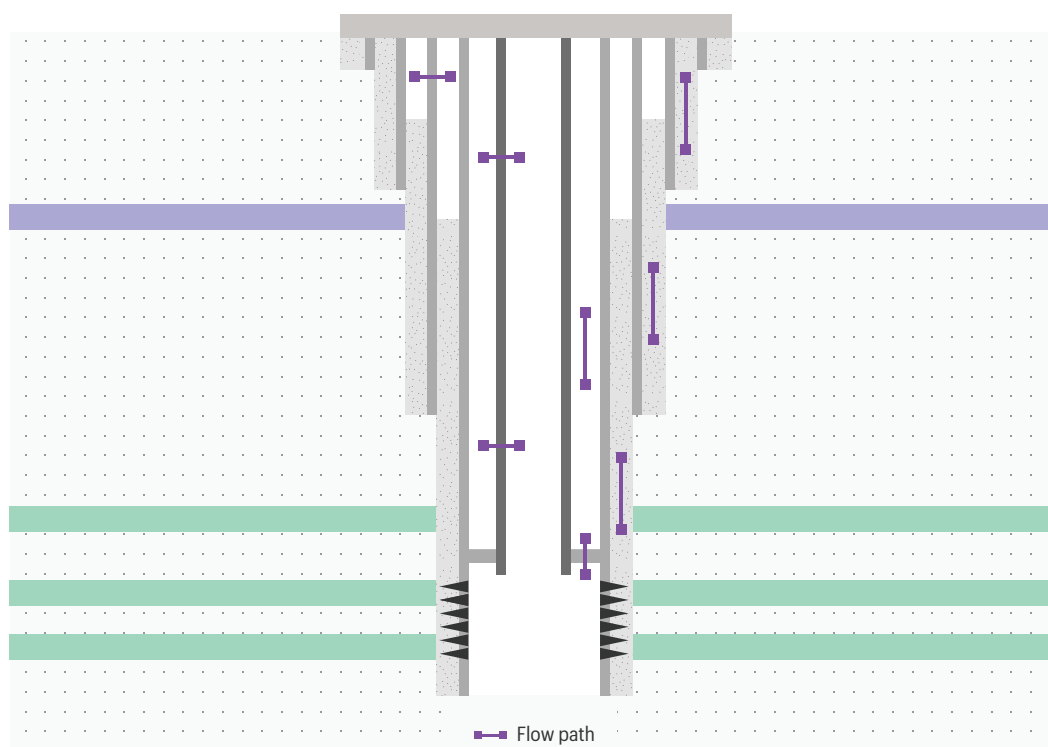
Leaks observed in an active well in the Netherlands forced the operator to suspend the well. An initial examination indicated that the integrity breach could be located in the tubing, casing or any of the completion elements within or beyond the A-annulus envelope. A pressure test confirmed that the leak rate was small, just 0.25 bar per day, but this was sufficient to pose a health, safety and environmental risk and trigger suspension of the well.

Leaks in the well system are a serious issue, and well integrity engineers want to understand precisely how and where the leaks originate so they can be repaired. The combination of many potential leak points spanning the length of the completion coupled with a small leak rate made this

a challenge to investigate. The operator needed diagnostics technology that had a large radial reach and was both sensitive and accurate enough to scan for leak points and help steer a repair programme.

Solution

The operator selected TGT's Multi Seal Integrity answer product, upgraded with the new ChorusX acoustic array platform to meet the three-part challenge of sensitivity, accuracy and reach. ChorusX combines an array of eight nano-synchronised acoustic sensors with advanced processing to deliver a dynamic recording range that is ten times wider than in previous Chorus technology, specifically at the 'quiet' low-amplitude end of the Acoustic Power Spectrum.



The higher-resolution measurements from the ChorusX array reveal flow activity with increased definition and clarity, and TGT's unique 'near-far' phase shift processing helps analysts distinguish between flow events near the wellbore, in the completion, and far from the wellbore, in the reservoir. This enables operators to target remedial actions with greater precision and implement them with higher confidence. The operator also chose to include Chorus9 technology in the survey programme to make a technical comparison between the two platforms.

Result

The Multi Seal Integrity survey was performed while applying pressure in the A-annulus and observing a pressure drop of 0.25 bar per day, confirming the very low leak-rate. The Chorus9 and ChorusX platforms both recorded acoustic signals at X378 m, but the Acoustic Power Spectrum

(APS) of ChorusX was far more detailed and informative (Figure 1).

The sharp change in polarity of the phase shift data, as seen in the Acoustic Phase Map, indicated a localised 'singular' leak point and its precise depth. The location and character of the data signature in the 'near' panel of the Acoustic Radial Map indicated that the source of flow was near the wellbore within the completion, and not in the reservoir. The precise nature of the radial map data signature further confirmed the exact depth of the leak source.

The combination of independent acoustic indicators enabled analysts and the operator to isolate the integrity breach to a single location in terms of depth, extent and radial distance from the wellbore. This enabled a highly targeted approach to remediation planning and implementation.

Multi Seal Integrity answer product using ChorusX. The Chorus9 acoustic power spectrum (left) indicates the approximate depth of the leak, but multiple indicators from ChorusX (right) combine to indicate the type, depth, radial proximity and extent of the integrity breach with much greater precision and clarity.

