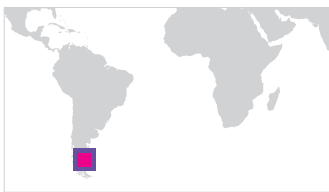




Decarbonise case study Multi Seal Integrity

Advanced acoustic surveys identify leak paths to guide remediation and stop methane emissions



Well type: Gas producer
Customer: YPF
Country: Argentina
Reference: SPE-211866

Case benefits

- Applied True Integrity system to target remediation of uncontrolled gas leak to surface.
- Provided rigless assessment of barrier failures, enabling effective plug and abandonment.
- Avoided unnecessary workover activities, minimising nonproductive time.
- Validated effectiveness of corrective cementing operations.
- Prevented gas migration to surface, and stopped methane emissions.

Challenge


A routine field survey discovered gas bubbling in the cellar of the subject well, right behind the conductor. None of the annuli in the well exhibited sustained pressure, complicating the task of locating the source and flowpath of the gas. The operator needed reliable diagnostic information to plan and target a remedial workover.

Analysis of cement bond and variable density logs (CBL/VDL) indicated a very poor cement bond behind the 9 $\frac{5}{8}$ in. casing and, in the 9 $\frac{5}{8}$ in. \times 13 $\frac{3}{8}$ in. pipe section overlap, there was no cement at all. After performing a pressure test of the annular space between the production tubing and the casing, and analysing samples of the bubbling gas, it was determined that the gas was coming from both the producing formation and a shallower formation.

Solution

The operator selected TGT's Multi Seal Integrity product using the Chorus (acoustic) platform and the Indigo high-precision temperature modules to perform a leak detection survey that would reveal both the source and the flowpath of the gas bubbling at surface.

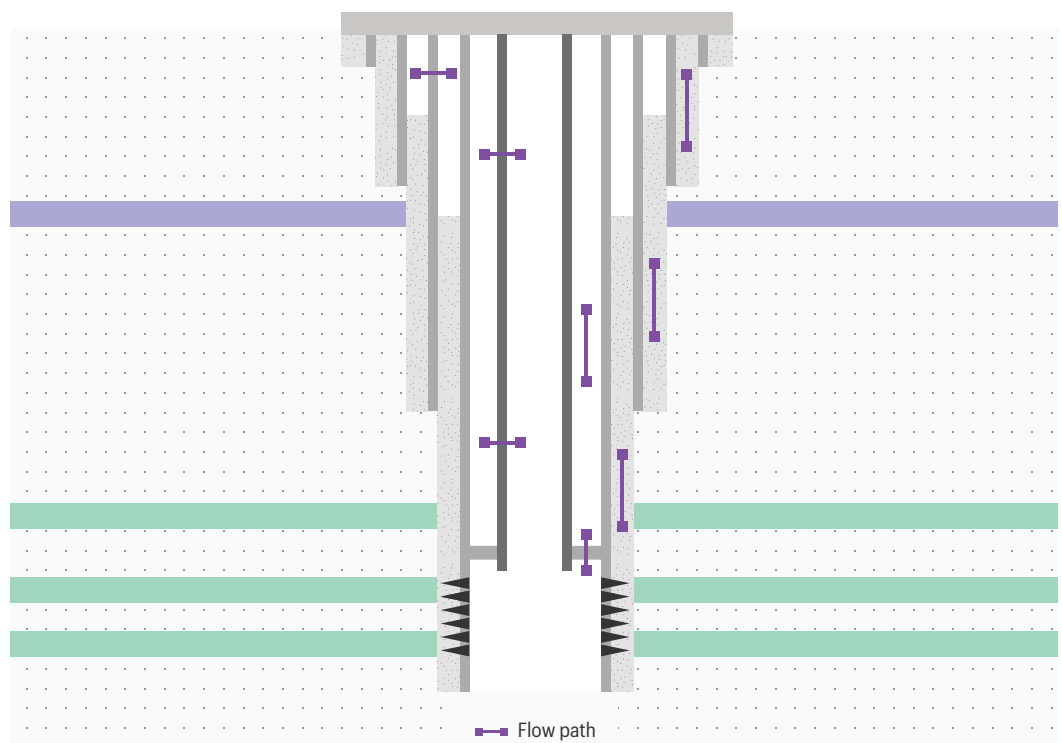
In contrast to traditional production logging methods, the Chorus acoustic system can identify minor fluid or gas migration behind multiple steel and cement barriers. The system's sensitive hydrophones can capture and characterise acoustic signatures associated with fluid flow through micro-annuli, cement channels and leaks in completions, or filtration through pores in the formation.

 Multi Seal Integrity example well sketch.

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 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.



Result

The complex flowpath started in the active reservoir, with gas moving up behind the 9 5/8 in. casing, with further contributions from two shallower formations. The gas continued up behind 9 5/8 in. casing to the 13 3/8 in. casing shoe, then up behind the 13 3/8 in. casing and finally behind the 20 in. casing to the surface. The operator developed a remediation plan based on this detailed understanding. The accuracy of the leak determination made it possible to avoid unnecessary workover-related activities and enabled the operator to minimise nonproductive time.

Several validation surveys were deployed to assess the effectiveness of the workover operations (Figure 1). After completion of the last corrective cementing job, the final survey showed that the source of gas

migration had been successfully isolated, although the cellar still showed signs of bubbling. The cause of this bubbling was that gas present in the system was still travelling through the well to reach the surface. This remnant gas left the system approximately one month after intervention, and the well showed no further signs of gas migration at surface.

TGT's Multi Seal Integrity product enabled the field operator to identify the gas source and shut it off. Methane is 80x more potent as a greenhouse gas (GHG) than carbon dioxide and it constitutes roughly 20% of all global GHG emissions. Eliminating fugitive methane emissions from the well helped to restore integrity and reduce the carbon intensity of energy production.



Figure 1
The final confirmation survey (left) showed that the source of the migrating gas had been successfully isolated. The cellar of the well still shows signs of bubbling due to remnant gas present in the well system, but this had cleared approximately one month after the workover.

