

## Case study Multi Seal Integrity

# Comprehensive diagnostics enables operator to target remediation of gas storage well



**Location:** West Russia  
**Well type:** Gas storage  
**Reference:** SPE-188656

### Case benefits

- Comprehensive diagnosis of leaks and unwanted flow paths in new gas storage well.
- Clearly identified flow paths behind casing from gas storage reservoir to overlying and underlying formations causing gas loss.
- Enabled targeted remediation to restore well to safe and productive operation.

### Challenge

The integrity of underground gas storage wells is crucial to the safety and efficiency of gas supply operations. In this case, immediately following completion of a newly drilled well, the operator discovered poor quality cement in the production casing annulus. This was concerning because it allowed for the possibility of cross-flows behind casing.

The operator decided to check the integrity of the entire well to ensure that no gas was escaping from the gas storage reservoir into other formations. The operator needed a clear understanding of the nature and location of any cross-flows to target an effective remediation programme.

### Solution

The operator selected TGT's 'Multi Seal Integrity' product as the best fit to understand the integrity dynamics of the well system and to reveal the presence of behind casing flow. Multi Seal Integrity is delivered by the 'True Integrity' system.

The diagnostic called for an integrated approach. TGT's True Integrity system was used which primarily comprised Chorus, Pulse and Indigo diagnostic platforms, coupled with conventional Pulsed-Neutron logging technology.

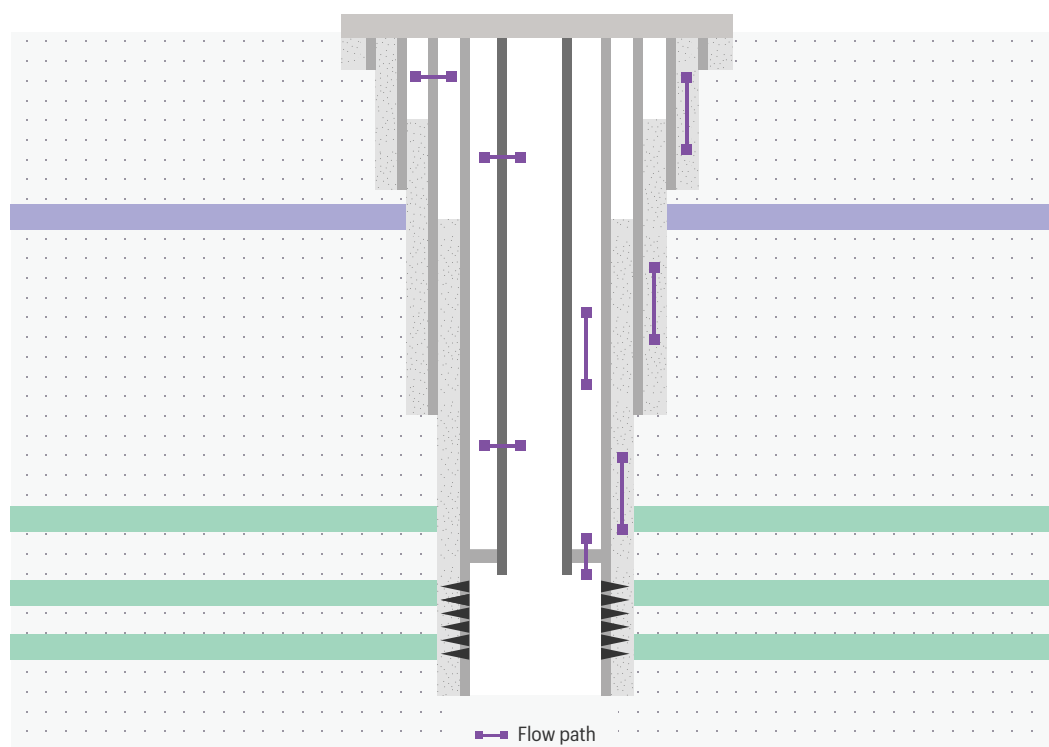
Chorus was used to record and analyse the acoustic energy produced by fluid flow throughout the well system and its role in this case was to help analysts pinpoint any gas migration from the storage reservoir.

 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.



Indigo provided complementary measurements, including heat exchange (HEX) data to confirm measure wellbore flow, and temperature to verify if there was any gas movement behind or inside the casing.

## Result

The results revealed unwanted gas flow behind the unperforated casing of this new well.

The Pulse platform indicated good casing condition and HEX detected no wellbore cross-flows. However, analysis of the Chorus acoustic spectrum indicated gas flow at the gas storage reservoir, which was flowing through channels in the cement to the

overlying and underlying reservoirs (Figure 1). All evidence pointed to gas emerging from the gas storage reservoir.

This analysis together with the temperature profile provided by Indigo, indicated an upward flow behind casing of gas from the storage reservoir to overlying formations, and downward gas flow into zones below the survey interval.

Gas accumulation outside the storage reservoir was confirmed by pulse neutron data.

The operator used the results to target successful workover operations and restored the well to normal operations.

The Multi Seal Integrity product was selected to investigate possible communication between the gas storage reservoir and adjoining formations in a new, unperforated well. The signature of the acoustic spectrum from Chorus revealed gas flow behind casing, both along a channel in cement and through the gas storage reservoir, as well as to overlying formations.

