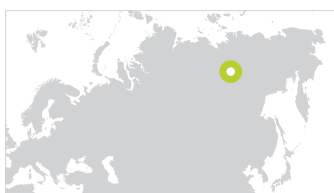


Case study Fracture Flow

Identifying unexpected water source and inflow profiles following multistage hydraulic fracturing



Location: Russia
Well type: Horizontal producer
Reference: SPE-191560

Case benefits

- Located and identified the fracture as the water source
- Enabled the operator to make informed decisions about workover requirements

Challenge

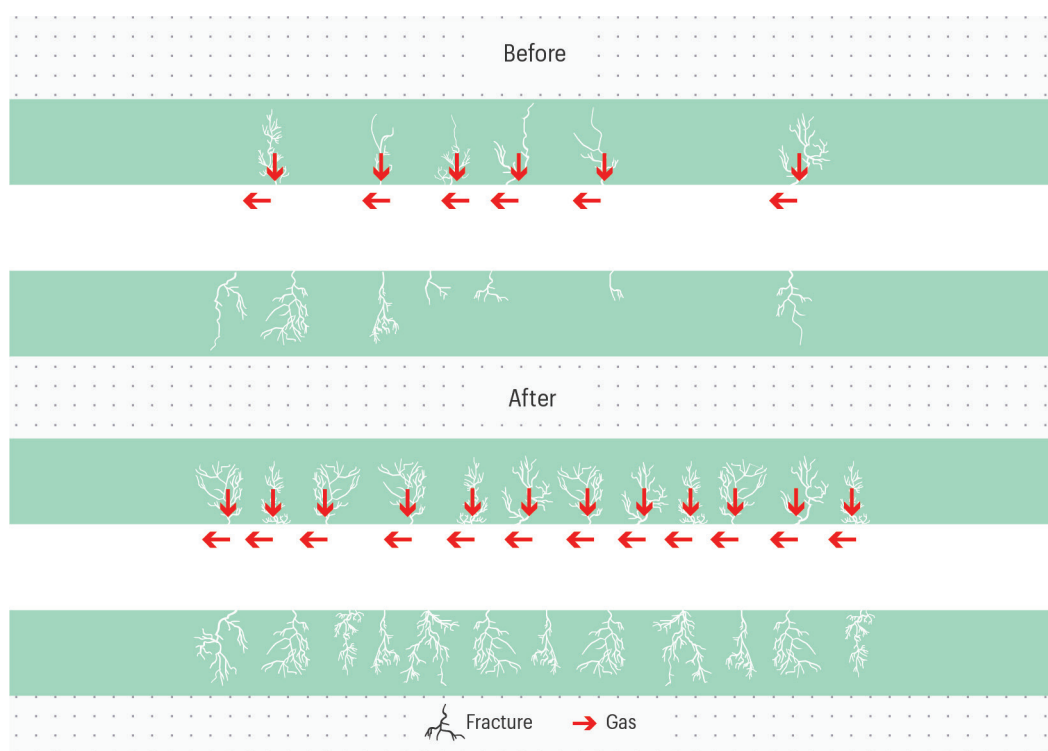
Multistage fracturing is an effective stimulation technique for heterogeneous, low-permeability oil reservoirs. However, after a fracturing campaign, there may be a risk of increased communication between the water-bearing formation, which may cause a high water cut in the stimulated well.

In this case from the Volga-Ural region of Russia, the operator wanted to identify unexpected water sources in a horizontal well in a low-permeability carbonate reservoir. The well had been subjected to a multistage acid fracturing job and it was necessary to determine the most effective strategy for a workover to shut off the water-producing zones.

Solution

The operator selected TGT's Fracture Flow product to understand the flow dynamics of the well system and identify the water sources. Fracture Flow is delivered by the True Flow diagnostic system. TGT's diagnostic systems combine several proprietary technology platforms that share a common structure and workflow comprising programs and methods; tools and measurements; processing and modeling; and analysis and interpretation.

The Chorus (acoustic) platform records and analyses the acoustic energy produced by fluid flow; its role in this case was to help pinpoint unexpected flow activity behind casing. The Fracture Flow product uses a multi-sensor tool, adopts a unique data acquisition programme and utilises a



Fracture Flow example well sketch.

Fracture Flow locates and quantifies flow before or after hydraulic fracturing.

Delivered by our True Flow System using Chorus technology Fracture Flow gives you the clarity and insight needed to manage well system performance effectively.

processing and modelling software plugin which varies from the other True Flow products.

In combination, the technique is able to identify the location and determine the distance of the acoustic signal from the receiver. It is therefore able to distinguish reservoir flows from those generated by completion leaks.

Result

An acoustic signal was recorded in a narrow interval above the target reservoir. This signal had a broadband spectrum that could have been generated by reservoir flow or by a completion leak (see Line A in Figure 1).

Taking into consideration the well design and the acoustic wave propagation in the wellbore and rocks, TGT's Chorus diagnostics determined that the location of the acoustic source extended beyond the wellbore. It was deduced that the signal was generated by turbulent flow from an unexpected fracture above the target reservoir. The inflow fluid from this unwanted fracture flowed back down the well completion, entering the wellbore through the topmost perforation. It was this rogue fracture that was the cause of water in the well production.

Thanks to Fracture Flow's diagnostic results, the operator changed the hydraulic fracturing design programme, to optimize production while preventing the re-occurrence of rogue fractures in the future.

Integrated logging suite results: Acoustic signal source identification

