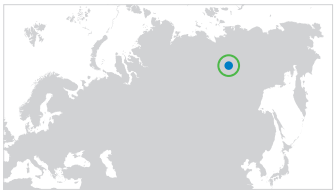
Case study Stimulate Flow

Operator evaluates the effectiveness of a stimulation programme in a horizontal injection well



Location: Russia
Well type: Horizontal water injector
Reference: SPE-193407

Case benefits

— Enabled direct measurement of the reservoir response before and after stimulation
— Provided evidence for the success of the stimulation program and revealed the post-stimulation injection distribution
— Helped the operator to assess well system performance and extend the productive life of the asset

Challenge

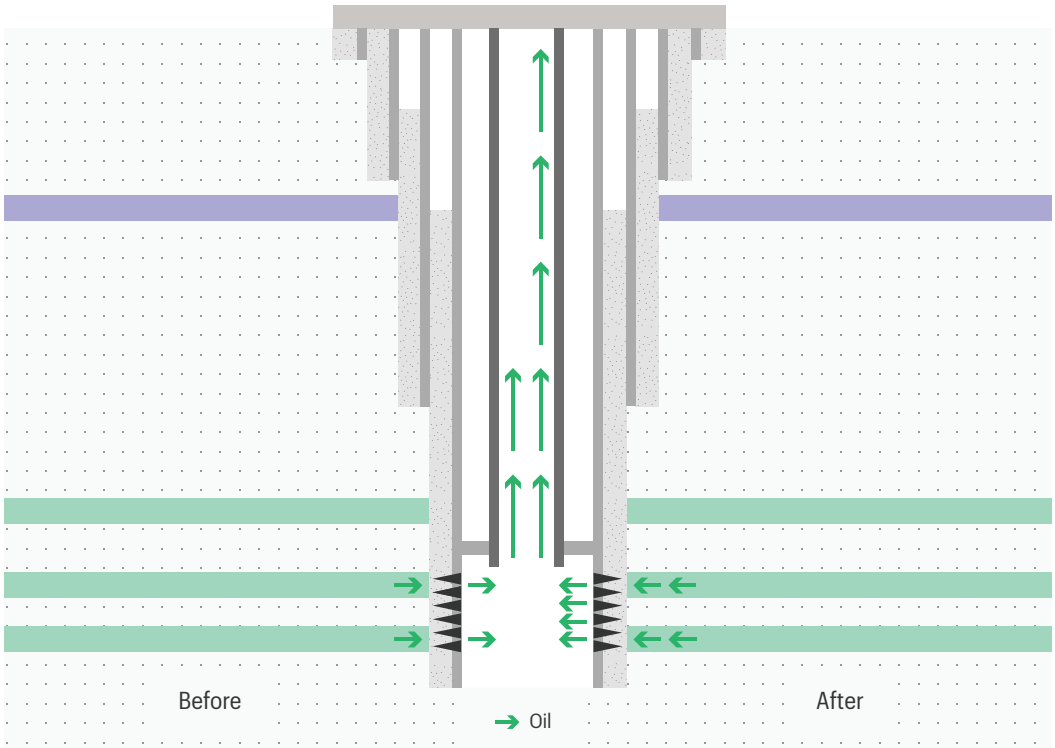
Tight or damaged reservoir sections often require stimulation to boost their performance. These sections can be identified during drilling operations (logging-while-drilling measurements) or after drilling using openhole wireline tools. Once the completion is run however, it is impossible to make these measurements, so the effectiveness of a stimulation program must be assessed by measuring the change in flow rate within the completion through, for example, a fracture port.

Direct measurement of the reservoir response before and after a stimulation job to assess a stimulation programme's effectiveness would be of huge benefit to field operators. In this example, the objective was to identify the reservoir injection flow profile for a horizontal water injection well that had failed to reach its target injection rate.

Solution

Delivered by the TGT True Flow system with Chorus acoustic platform and Cascade thermal platform, Stimulate Flow provides quantitative information on flow profiles and can assess reservoir and well performance before and after acid stimulation.

A reservoir flows analysis suite comprising Chorus and Cascade platforms were applied to the subject well. The measurements were made during continuous down-passes and at stations during up-passes under shut-in and flowing conditions.



Stimulate Flow example well sketch.

Stimulate Flow locates and quantifies flow before or after stimulation.

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

Spectral analysis of acoustic data is a proven technology for assessing and evaluating reservoir performance. This advanced technique can identify acoustic energy associated with fluid movement within the reservoir matrix and fractures with a 1-m vertical resolution. Running a stationary spectral acoustic Chorus survey before and after well stimulation reveals where improved matrix flow has been achieved and/or new active fractures have developed.

Result

Detailed pre- and post-stimulation reservoir injection flow profiles were constructed based on analysing the Chorus and Cascade data. These surveys revealed that, before the stimulation program, very little injected fluid was penetrating the heel and middle parts of reservoir section and that most of the fluid was entering the reservoir at the toe end (Figure 1).

After an acid stimulation was performed, the post-stimulation survey showed uniform injection distribution from heel to toe, thus confirming a successful stimulation job.

The ability to acquire behind-pipe reservoir flow profiles is crucial for the planning and assessment of stimulation operations. A combination of Chorus and Cascade's platforms were used to quantify the reservoir injection flow profile. Applying the Stimulate Flow product enabled the operator to assess how the reservoir had reacted to stimulation and to plan stimulation treatments for other wells.

Pre- and post-stimulation evaluation for a horizontal water injection well. Chorus indicated a much more uniform distribution of injected water following the acid stimulation program