TGT

Case study Sand Flow

Identification of sand-producing intervals enables operator to optimise well operations

Location: Indonesia
Well type: Deviated gas producer
Reference: SPE-196445

Case benefits

- Identified the sand-producing interval in a deviated gas producer
- Differentiated between primary (flow from reservoir) and secondary (in-wellbore flow) sand impacts
- Enabled the field operator to select and implement an optimum well operating regime and resume gas production from the well

Challenge

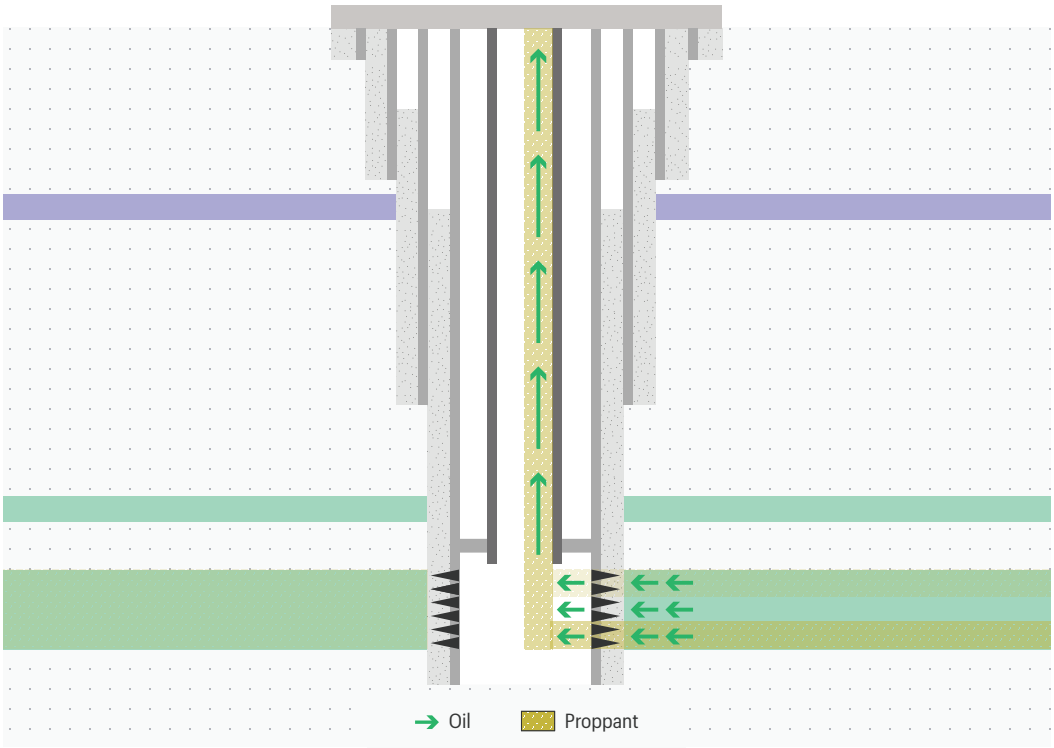
Solid particles can be transported from the reservoir into the wellbore when an oil or gas well is flowing. These particles may be natural solids such as sand grains or proppants that were injected into the reservoir during hydraulic fracturing. Identifying the sources of solids entering a well is a vital first step to controlling the problem.

This well is a deviated producer in a giant natural gas field in the South China Sea. Drilled and put on production during 2010, the well was found to be producing sand at about 120 cm^3/hr in 2017, which resulted in the well being shut in. The operator wanted to identify and eliminate the sources of sand and resume production.

Solution

The integrated programme and method used to assess fluid and sand inflows, combined high-sensitivity spectral acoustic logging and high-precision temperature measurements. The operator selected TGT's Sand Flow product to characterise sand production. Sand Flow is designed to identify the locations where sand enters the wellbore and to provide a qualitative assessment of sand count. It is delivered by the True Flow diagnostic system using the Chorus acoustic platform together with high-precision temperature measurement.

Chorus locates sand production intervals by detecting the signals generated by solid particles striking the housing of the acoustic logging tool. The acoustic data was analysed in a time domain and the specific



Sand Flow product precisely locates sand or proppant entry into the wellbore and provides a qualitative solids count, clearly identifying problem zones, even in turbulent flow conditions.

Delivered by our True Flow system with Chorus technology, Sand Flow provides the clarity and insight needed to manage sand production more effectively.

signals associated with primary strikes of solid particles (sand grains) against the tool housing were identified.

The programme and method for acquiring data required two different steady state production regimes: with the choke 40/64 in. (flowing regime 1) and 26/64 in. (flowing regime 2) to find the optimum well operating regime.

Result

The highest number of high-energy sand grain strikes against the tool housing was registered opposite the zone 3 perforation interval during the flowing 1 regime (Figure 1). Strikes across this interval reached 60 grains/s and the volume of sand produced at surface varied from 40 to 90 cm^3/h. Reducing the pressure drawdown (switching to the flowing 2 regime) reduced the number of primary sand grain strikes at zone 3 to 40 grains/s.

Some (secondary) sand grain strikes were caused by sand grains in a turbulent gas-water flow along the wellbore and not by lateral sand production flow from the reservoir. Their energy and number are much lower than those of strikes recorded at zone 3. These are shown as blue points on the sand energy panel.

Based on the spectral analysis of the Chorus acoustic data, it was determined that zone 1 and zone 2 were the main contributors of gas production, but these intervals were not found to be the sources of sand production to the surface. Zone 3 was found to be the only sand producing interval knowing the sand entry location at different well operating regimes, the operator was able to determine and implement an optimum well operating regime that minimised the impact of sand production.

Figure 1. Acoustic data output, used for detecting the sand production source