

CASE STUDY

MICROGUIDE ANALYSIS REVEALS TUBING BEHAVIOR AT DIFFERENT TENSION/COMPRESSION VALUES, ENABLING OPTIMIZED ALS DESIGN

▶ TECHNOLOGY

- MicroGuide™ wellbore tortuosity logs

▶ APPLICATION

- Artificial lift
- Rod guide design
- Tubing anchor catcher placement
- Tubing wear identification
- Survey validation

▶ LOCATION

- Eagle Ford Shale

INDUSTRY CHALLENGE + OBJECTIVE

An E&P company with artificial lift operations in the Eagle Ford shale was experiencing breakdowns and a fall in production closely following workover operations. The operator discovered the tubing anchor catcher (TAC) had sheared and released itself in the tubing string. Additionally, after workovers, the operator noted the tubing was in compression rather than in tension, as required for efficient pumping conditions.

Initially, a third-party surveyor provided gyro surveys ran in 20-ft increments. However, the data provided failed to identify areas of buckling and damage in the tubing. Further, these surveys did not provide enough information on the cause of the TAC's malfunction.

The operator requested Gyrodata provide a detailed analysis of the tubing behavior and conditions when it was in neutral and varying tension and compression values. This information would allow the operator to determine the axial loading limits during workovers, improve the rod guide design, and optimize TAC placement for increased production rates.

TECHNOLOGY + SERVICE SOLUTION

- Gyrodata recommended utilizing MicroGuide high-resolution tortuosity logging service. This allowed high-accuracy surveys to be taken at 1-ft increments for the clearest possible representation of the wellbore's profile and condition.
- MicroGuide was run in five different scenarios at 7,000 to 9,000-ft MD.
- In the first run, the tubing was clearly in compression. In the second run, the tubing was placed in a neutral position. In the third, fourth, and fifth runs, the tubing was placed under tension at 10,000, 15,000, and 20,000 lb, respectively.

RESULTS + VALUE DELIVERED

- In the first run, MicroGuide revealed extensive amounts of spiraling in the tubing, which was causing high tortuosity. In the second run, the tubing was placed in a neutral position. The spiraling was eliminated, but the MicroGuide log revealed areas of severe tortuosity towards the bottom of the well. All three (10,000, 15,000, 20,000-lb) tension strings ran in showed similar results when processing the MicroGuide analysis.
- MicroGuide was able to deliver a true picture of what the tubing was doing downhole at various sections of the well.
- In addition, after comparing our surveys to those of the third-party company, we found that our surveys aligned with the MWD survey perfectly in all five runs, while the third-party survey was around 40 ft off from our five runs. We also proved that the 20-ft surveys the third-party surveyor submitted to the engineer were in fact 100-ft surveys that were interpolated into 20-ft increments.
- The customer noted that MicroGuide would be incorporated into the artificial lift project planning stages to ensure optimal artificial lift system (ALS) design to support well conditions the first time.

CUSTOMER TESTIMONIAL

"This well, along with several others, have recently been found with unset/sheared tubing anchors soon after workover operations. Based on our pump dynamometer cards, the issue was originally diagnosed as trash in our pump causing high downhole friction. However, we soon found out that our TACs were shearing when a rig moved in and we began noticing our tubing was in compression, rather than in tension as it was left. One explanation to this was that when the TAC sheared, it would jump up-hole and catch high on the casing again, and in turn, buckle the tubing. The purpose of running the gyro at different tension/compression values was to understand how the tubing behaved when in compression, neutral, and different tension values. From the gyros, we found that it was evident that when tubing is in compression, in this case 20,000-lb compression (as found by the rig), the tubing would buckle enough to put the rods in a bind, causing excessive downhole friction and restricting pump efficiency."