MATURE FIELDS

UNCONVENTIONALS

CASE STUDY

FiberLog™ Service Provides Real-Time Analysis During Fluid Injection

FIBER-OPTIC-ENABLED WIRELINE SOLUTION EVALUATES FLUID DISTRIBUTION ACROSS WELLBORE OF INJECTION WELL

ONSHORE U.S.

CHALLENGES

- Use fiber-optic results to determine interval taking injection fluid
- Evaluate fluid distribution in real time

SOLUTION

Leverage FiberLog™ service to assess injection distribution across the wellbore

RESULTS

- FiberLog service provided real-time insight for fluid distribution
- Data showed that only a short section of perforated interval was taking fluid
- Provided insight to reduce completion costs on future wells

OVERVIEW

Low-rate fluid injection is a very common practice across multiple basins and fields globally. The application for this low-rate injection can range from wellbore cleanout, water injection for enhanced oil recovery (EOR), acid placement, fluid disposal, or even restimulation. One major challenge that is common across those applications is the lack of real-time understanding for fluid entry distribution across the sand face. Often, results are estimated based on wellhead pressure conditions, or based on log passes done after the injection is completed. The gaps in this approach are the lack of real-time knowledge and an inability to adjust the injection if an inefficiency is identified.

CHALLENGES

An operator was targeting a low-rate water injection for a vertical U.S. land well, with the goal of distributing fluid across an entire perforated interval. The targeted perforated interval was roughly 150 feet (46 meters), and the operator was unsure where the fluid was being placed during injection. For this particular operation, the water injection would last for roughly 12 hours, followed by a shut-in period. The goal was to determine fluid injection during this time and to quantify that distribution.

SOLUTION

Halliburton deployed its fiber-optic-enabled wireline solution, FiberLog™ service, in the well during injection. This service enabled the operator to see real-time distributed temperature sensing (DTS) and distributed acoustic sensing (DAS) results, which indicated fluid distribution. Both injection and shut-in results were captured during this acquisition, allowing the operator to view the entire wellbore in real time through the fiber-optic analysis, including the perforated interval at the bottom of the wellbore.

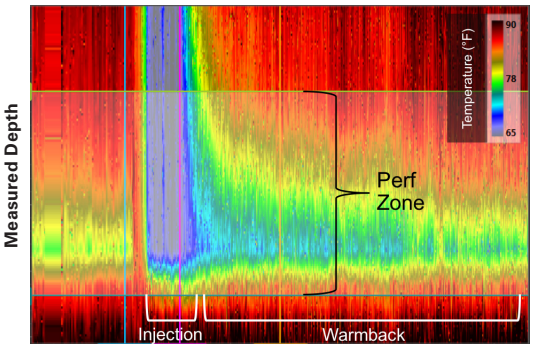

Figure 1 A DTS color map showing a real-time DTS display of fluid injection

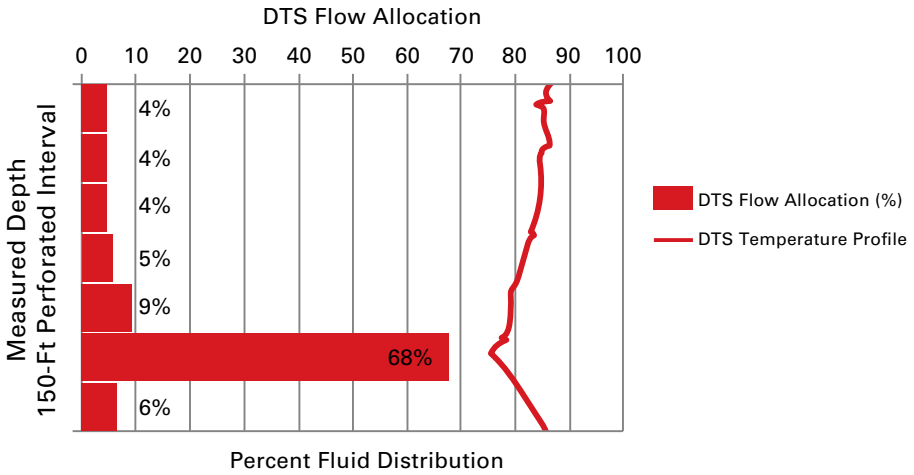

Figure 2 Quantitative fluid distribution, using FiberLog™ results

RESULTS

Real-time data was viewed at the wellsite during fluid injection and warmback. The DTS results are captured in Figure 1. This image highlights the perforated section of the wellbore and shows the thermal results during that time period, including approximately 12 hours of injection data and 72 hours of warmback data. Typically, during injection, most of the interval will be cold. However, during warmback, the coldest portions of the wellbore indicate where most of the fluid has been placed. In this case, a significant portion of the fluid was exiting the deeper portion of the interval. Figure 2 illustrates how this injection and warmback data are quantified into fluid distribution across the entire perforated interval. As illustrated in this figure, 68 percent of the fluid is exiting the second deepest perforation interval. The other intervals all take a marginal amount of fluid.

Understanding the placement of fluid within the reservoir will aid this operator in altering their completion design on future wells. The results from this FiberLog study will save the operator completion costs on from their current design.

HALLIBURTON