CASE STUDY

WELL-RESERVOIR PERFORMANCE EVALUATION BY STREAM™ IN HORIZONTAL HIGH WATER CUT OIL PRODUCER

Location: Middle East.

Well type: horizontal oil producer.

Challenge: high water cut open hole horizontal oil producer.

Objective: identify water inflow zones and construct the current production profile across the open hole section for further well performance optimization through WSO.

Solution: considering the well trajectory and the open hole completion, there was a challenge for the operator to run the conventional spinner-based production logging for profile evaluation. Therefore, the STREAM™ has been proposed to ensure that the appropriate data for the wellbore-reservoir flow evaluation will be obtained. The combination of T-FLOW and FIND technologies was applied for precise localization of main reservoir flow intervals along with their confirmation by wellbore flow profiling with TFT technology.

STREAM™ (SPINNERLESS **T**ECHNOLOGIES for **R**ELIABLE **E**VALUATION, **A**NALYSIS, and **M**ODELING of well-reservoir flow)

A powerful suite of tools and technologies that provide high-resolution and accurate logging capabilities. STREAM is an integration of FIND, TFT, and T-FLOW technologies, working in perfect harmony to unlock unparalleled insights into the processes occurring inside and beyond the wellbore.

Thermal Flow Tool (TFT)
The TFT works on the principle of a thermal anemometer: the TFT sensor is heated-up by the battery current to a temperature higher than the temperature of the surrounding fluid. The fluid flow cools the sensor and thereby changes its active resistance, which is inversely proportional to the average linear flow rate. It allows to calculate the flow rate and build a production or injection profile.

T-FLOW (Temperature Modeling)
The math solver allows predicting the heat exchange between the wellbore and the reservoir based on hydro/thermo-dynamic theory and high-resolution temperature data acquired by the High-Resolution Temperature Tool (HRT). The method provides a detailed reservoir production/injection profile for open/cased hole wells with vertical, deviated, and horizontal trajectories.

FIND (Flow Identifying Noise Detector)
A new-generation spectral noise logging tool records data by four channels with different frequency ranges and amplification to signal. It allows to provide detailed full-spectrum acoustic profile without distortion, including wellbore/reservoir flow intervals detailing, fractures localization, leak detection, and flow behind the casing determination.

Results

The TFT data processing is similar to the spinner-based. The final TFT-processed curves (green and red on the chart below) allow to distinguish zones of production and construct the profile. Based on the TFT profile, the major production zone covers over 40% of the open hole section starting from the 7" casing shoe. There are five zones of minor production also detected across the remaining part of the lateral.

The T-FLOW results perfectly match with the TFT-based profile revealing the same main reservoir production zone across the first half of the logging interval as well as the remaining section of the well where the five narrow inflow intervals were detected.

Both TFT-based and T-FLOW profiles were clearly confirmed by contrast high-frequency responses on the FIND data indicating the reservoir flow across detected production zones.

Major outcomes

- 40% of the open hole section from below the liner shoe is characterized by major water production

- 5 narrow local water production intervals identified across remaining OH interval

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