CASE STUDY

FLOWJET TECHNOLOGY, **STREAM**™ AND MBTT CORROSION LOGGING ALLOW TO EVALUATE PERFORATIONS PERFORMANCE AND WELL OPTIMIZATION FOR HIGH WATER CUT VERTICAL OIL PRODUCER

Location: North Africa

Well type: vertical oil producer

Average production rate (by FlowJet Pump): 1004 bpd

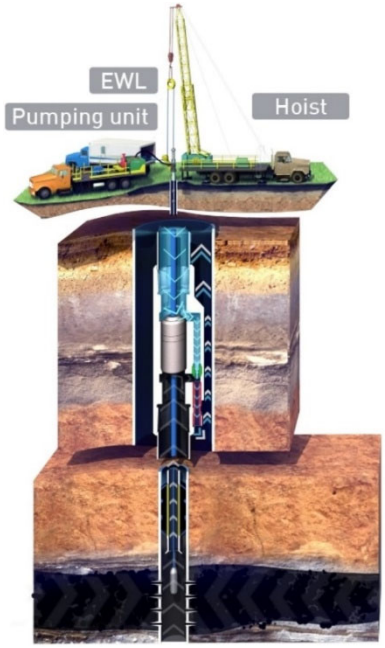
Challenge: high water cut well with multiple perforation zones.

Objectives: identify water inflow zones and construct the current production profile across perforation zones and reservoir for further well optimization; assess the integrity of casings.

Solution: since the Y-tool or dual string were not available to conduct the MPLT in the flowing regime, the FlowJet Technology has been proposed to be done during the planned ESP replacement workover. Due to the challenge of precise evaluation of the flow across perforation zones and behind the casing (from the reservoir) the STREAM™ was proposed, including the F-FLOW and FIND Technologies for reservoir flow profile evaluation as well as FBS tool for wellbore flow evaluation. The casing integrity evaluation was proposed to be done by MBTT during a separate run.

FLOWJET TECHNOLOGY

The technology allows the creation of an artificial lift during the MPLT for reservoir performance evaluation.
The FlowJet Pump (FJP) is run on the tubing pipes to the required depth during the workover. The water is pumped inside the tubing to activate the FJP. Then pumped water and wellbore fluid are lifted through the A-annulus to the surface.



STREAM™ (**S**PINNERLESS **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.

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, or 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.

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Results

Based on the FBS results the main production zone relates to the top perforation (Perf. 1 on the chart below) and the overlying corrosion interval. Both zones were clearly detected by the MBTT as a significant metal loss. The conclusion is correlated with gradient changes on a zoomed temperature curve (bold blue on the chart below) and low-frequency noise anomaly on FIND data confirming the upward wellbore flow. The T-FLOW profile matches the spinner-based profile regarding the main production zone. However, the profile also shows an extended reservoir contribution zone above the main production zone. The same is confirmed by contrast extended noise anomaly on a high-frequency domain of FIND data.
Another production zone was classified as a minor and corresponds to the bottom perforation (Perf. 2 on the chart below). Such a conclusion is supported by the spinner-based and T-FLOW profiles, as well as FIND response with continuously increasing low-frequency signal towards to the bottom of the logging interval confirming the upward wellbore flow.

Major outcomes

- determination of a main production zone (perforations performance evaluation)
- continuous communication of formation fluid (predominantly water) across the entire reservoir section behind the casing
- casing integrity issue above the Perf. 1 that opened for the flow